



# FCC Test Report

## FCC Part 15.247 for DSSS systems

FOR:

**GSM Cellular Telephone with Bluetooth and Wifi**

**Model #: A1203**

**Apple Inc.  
1 Infinite Loop Mail Stop26A  
Cupertino, California 95014  
U.S.A**

**FCC ID: BCGA1203**

**TEST REPORT #: EMC\_ACIHO\_010\_06002\_FCC15\_247WLAN  
DATE: February 6<sup>th</sup>, 2007**



**FCC listed#  
101450**

**IC recognized #  
3925**

**CETECOM Inc.**

411 Dixon Landing Road ♦ Milpitas, CA 95035 ♦ U.S.A.

Phone: + 1 (408) 586 6200 ♦ Fax: + 1 (408) 586 6299 ♦ E-mail: [info@cetecomusa.com](mailto:info@cetecomusa.com) ♦ <http://www.cetecom.com>

CETECOM Inc. is a Delaware Corporation with Corporation number: 2113686

Board of Directors: Dr. Harald Ansorge, Dr. Klaus Matkey, Hans Peter May



## **TABLE OF CONTENTS**

<b>1</b>	<b>ASSESSMENT</b>	<b>4</b>
	<b>TECHNICAL RESPONSIBILITY FOR AREA OF TESTING:</b>	<b>4</b>
	EMC & Radio	4
<b>2</b>	<b>ADMINISTRATIVE DATA</b>	<b>5</b>
2.1	Identification of the Testing Laboratory Issuing the EMC Test Report	5
2.2	Identification of the Client	5
2.3	Identification of the Manufacturer	5
<b>3</b>	<b>EQUIPMENT UNDER TEST (EUT)</b>	<b>6</b>
3.1	Specification of the Equipment under Test	6
<b>4</b>	<b>SUBJECT OF INVESTIGATION</b>	<b>7</b>
<b>5</b>	<b>MEASUREMENTS</b>	<b>8</b>
5.1	<b>SPECTRUM BANDWIDTH OF DSSS SYSTEM §15.247(a) (2)</b>	<b>8</b>
5.1.1	Limit	8
5.1.2	Results	9
5.2	<b>MAXIMUM PEAK OUTPUT POWER § 15.247 (b) (1) (Conducted)</b>	<b>15</b>
5.2.1	Limit	15
5.2.2	Results	16
5.3	<b>POWER SPECTRAL DENSITY §15.247 (d)</b>	<b>22</b>
5.3.1	Limit	22
5.3.2	Results	23
5.4	<b>RESTRICTED BAND EDGE COMPLIANCE RADIATED §15.247/15.205</b>	<b>29</b>
5.4.1	LIMITS	29
5.4.2	Results Lower Restricted Band 2310 MHz to 2390 MHz	30
5.4.3	Results Upper Restricted Band 2483.5 MHz to 2500 MHz	34
5.5	<b>TRANSMITTER SPURIOUS EMISSIONS RADIATED § 15.247/15.205/15.209</b>	<b>38</b>
5.5.1	LIMITS	38
5.5.2	RESULTS	39
5.6	<b>EMISSION LIMITATIONS § 15.247 (c) (1)</b>	<b>48</b>
5.6.1	Limits	48
5.6.2	Results	49



<b>5.7</b>	<b>AC POWER LINE CONDUCTED EMISSIONS § 15.107/207</b>	<b>52</b>
5.7.1	Limits	52
5.7.2	Results Mitsumi Charger	53
5.7.3	Results Foxlink Charger	54
<b>6</b>	<b>TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS</b>	<b>55</b>
<b>7</b>	<b>BLOCK DIAGRAMS</b>	<b>56</b>



## 1 Assessment

The following is in compliance with the applicable criteria specified in FCC rules Part 15.247 of the Code of Federal Regulations.

Company	Description	Model #
Apple Inc.	GSM Cellular Telephone with Bluetooth and Wifi	A1203

Technical responsibility for area of testing:

2/6/2007    EMC & Radio    Lothar Schmidt  
(Test Lab Manager)

A handwritten signature in blue ink, appearing to read "Lothar Schmidt", written over a horizontal line.

Date

Section

Name

Signature

The test results of this test report relate exclusively to the test item specified in Identification of the Equipment under Test. The CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM Inc USA.



## **2 Administrative Data**

### **2.1 Identification of the Testing Laboratory Issuing the EMC Test Report**

Company Name:	CETECOM Inc.
Department:	EMC
Address:	411 Dixon Landing Road Milpitas, CA 95035 U.S.A.
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Responsible Test Lab Manager:	Lothar Schmidt
Responsible Project Leader:	Pete Krebill
Date of test:	1/26/2006 to 2/5/2007

### **2.2 Identification of the Client**

Applicant's Name:	Apple Inc.
Street Address:	1 Infinite Loop Mail Stop26A
City/Zip Code	Cupertino, California 95014
Country	USA
Contact Person:	Robert Steinfeld
Phone No.	408-974-2618
Fax:	408-862-5061
e-mail:	steinfel@apple.com

### **2.3 Identification of the Manufacturer**

Manufacturer's Name:	Same as applicant
----------------------	-------------------



### **3 Equipment under Test (EUT)**

#### **3.1 Specification of the Equipment under Test**

Marketing Name:	A1203
Description:	GSM Cellular Telephone with Bluetooth and Wifi
Model No:	A1203
Hardware Revision :	M68 DVT
Software Revision :	M68 DVT
FCC ID:	BCGA1203
Frequency Range:	2412-2462 MHz
Type(s) of Modulation:	CCK, OFDM
Number of Channels:	11
Antenna Type:	Patch
Output Power:	27.51 dBm (0.564W) peak conducted power



---

#### **4 Subject Of Investigation**

All testing was performed on the product referred to in Section 3 as EUT.

The objective of the measurements done by Cetecom Inc. was to measure the performance of the EUT as specified by requirements listed in FCC rules Part 15.247 of Title 47 of the Code of Federal Regulations. The maximization of portable equipment is conducted in accordance with ANSI C63.4.

## 5 Measurements

### 5.1 SPECTRUM BANDWIDTH OF DSSS SYSTEM

§15.247(a) (2)

#### 6 dB bandwidth

TEST CONDITIONS			6 dB BANDWIDTH (kHz)		
Frequency (MHz)			2412	2437	2462
802.11b	T <sub>nom</sub> (23)°C	V <sub>nom</sub> (4.2) VDC	10.02	9.97	10.02
802.11g	T <sub>nom</sub> (23)°C	V <sub>nom</sub> (4.2) VDC	16.58	16.58	16.58

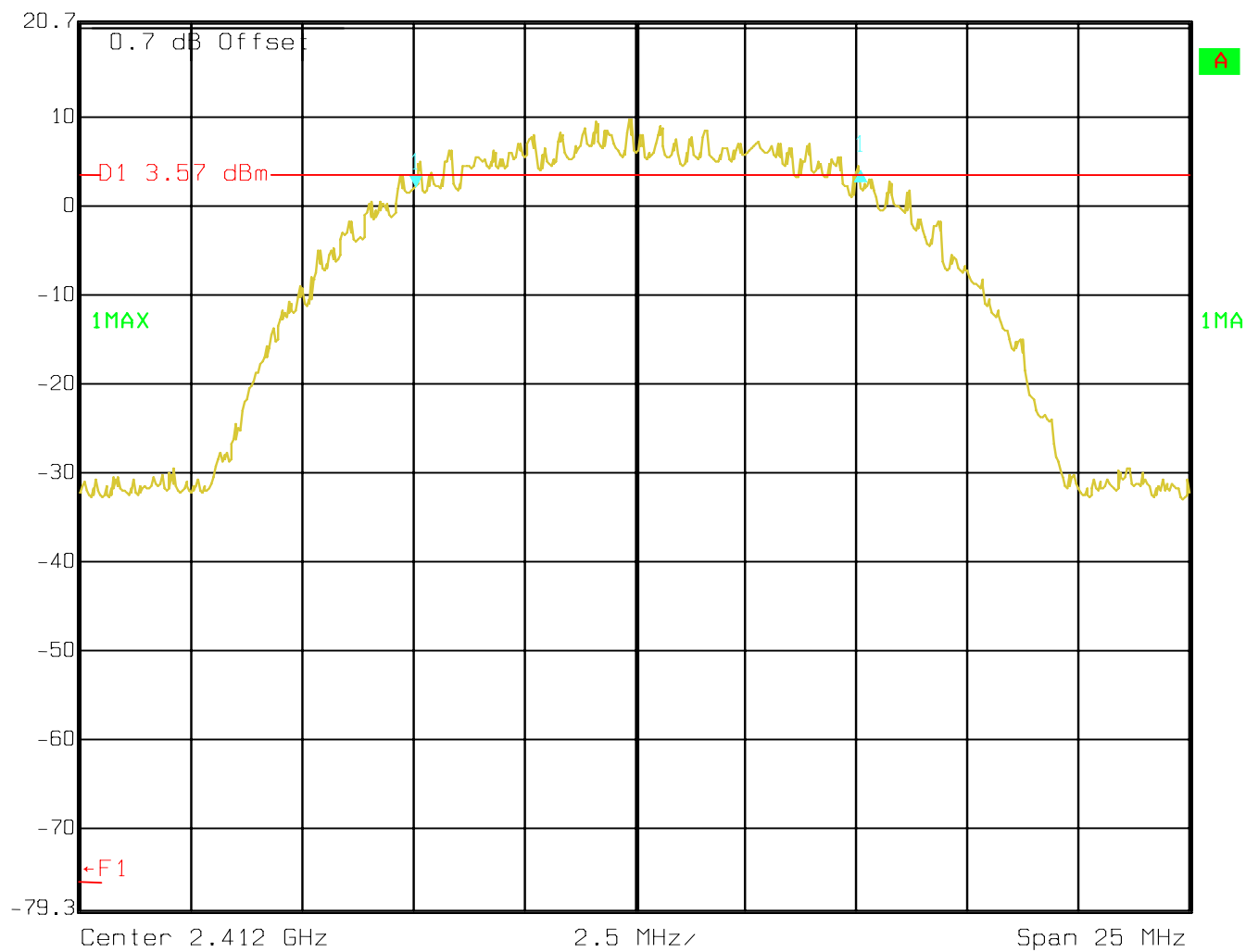
#### 5.1.1 Limit

##### SUBCLAUSE §15.247(a) (2)

The minimum 6dB bandwidth shall be at least 500 KHz

**5.1.2 Results****SPECTRUM BANDWIDTH OF DSSS SYSTEM****§15.247(a) (2)****6 dB bandwidth****Lowest Channel: 802.11b 2412MHz**

 Delta 1 [T1] RBW 100 kHz RF Att 50 dB  
Ref Lvl 20.7 dBm 2.18 dB VBW 100 kHz  
10.02004008 MHz SWT 500 ms Unit dBm



Date: 31.JAN.2007 17:53:05

**SPECTRUM BANDWIDTH OF DSSS SYSTEM****§15.247(a) (2)****6 dB bandwidth****Mid Channel: 802.11b 2437MHz**

Delta 1 [T1]

RBW 100 kHz RF Att 50 dB

Ref Lvl -0.20 dB

VBW 100 kHz

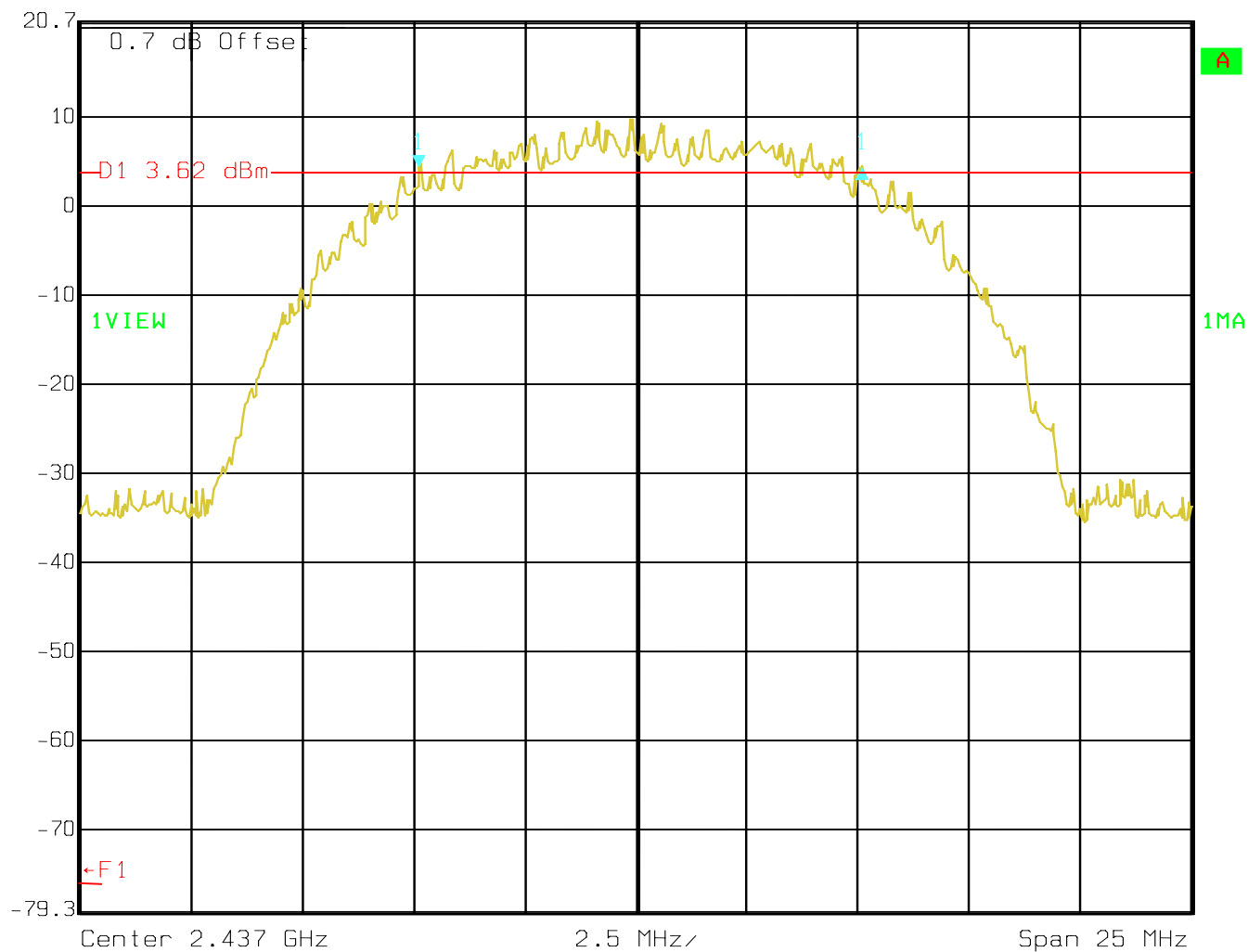
20.7 dBm

9.96993988 MHz

SWT 500 ms

Unit

dBm



Date: 31.JAN.2007 17:55:27

**SPECTRUM BANDWIDTH OF DSSS SYSTEM****§15.247(a) (2)****6 dB bandwidth****Highest Channel: 802.11b 2462MHz**

Delta 1 [T1]

RBW 100 kHz RF Att 50 dB

Ref Lvl 2.02 dB

VBW 100 kHz

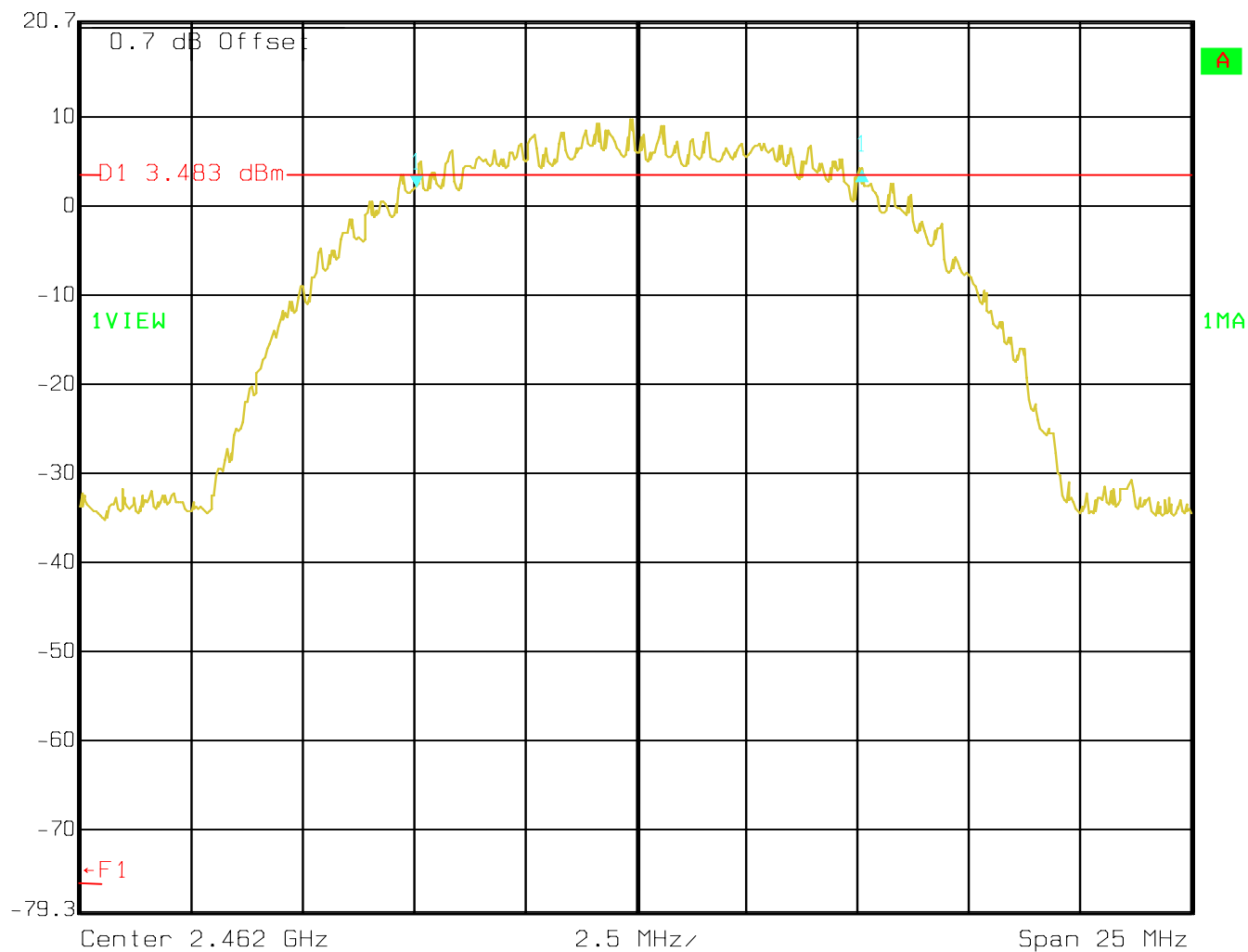
20.7 dBm

10.02004008 MHz

SWT 500 ms

Unit

dBm



Date: 31.JAN.2007 17:47:59

**SPECTRUM BANDWIDTH OF DSSS SYSTEM****§15.247(a) (2)****6 dB bandwidth****Lowest Channel: 802.11g 2412MHz**

Delta 1 [T1]

RBW 100 kHz RF Att 50 dB

Ref Lvl

-1.97 dB

VBW 100 kHz

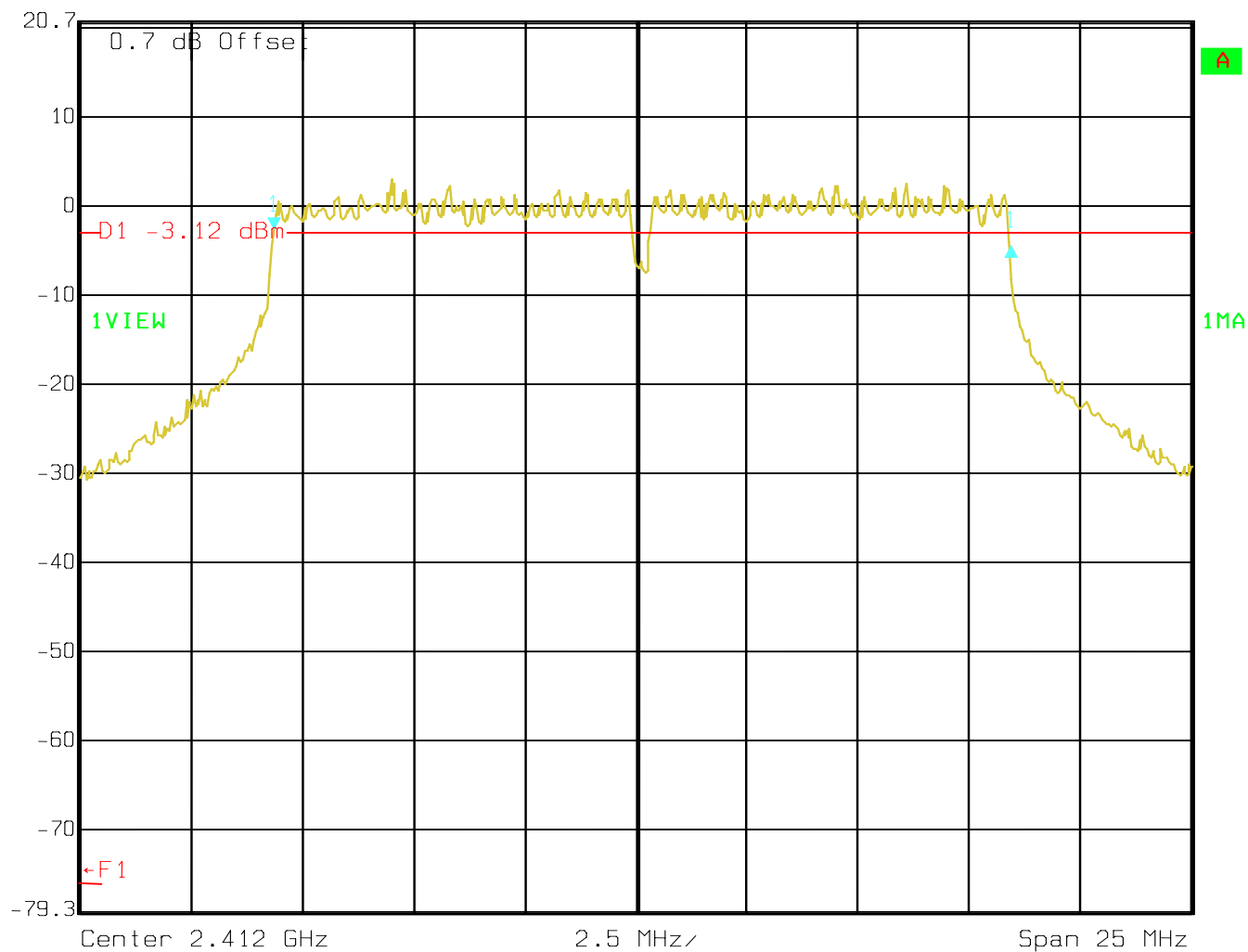
20.7 dBm

16.58316633 MHz

SWT 500 ms

Unit

dBm



Date: 31.JAN.2007 17:56:31

**SPECTRUM BANDWIDTH OF DSSSS SYSTEM****§15.247(a) (2)****6 dB bandwidth****Mid Channel: 802.11g 2437MHz**

Delta 1 [T1]

RBW 100 kHz RF Att 50 dB

Ref Lvl -1.60 dB

VBW 100 kHz

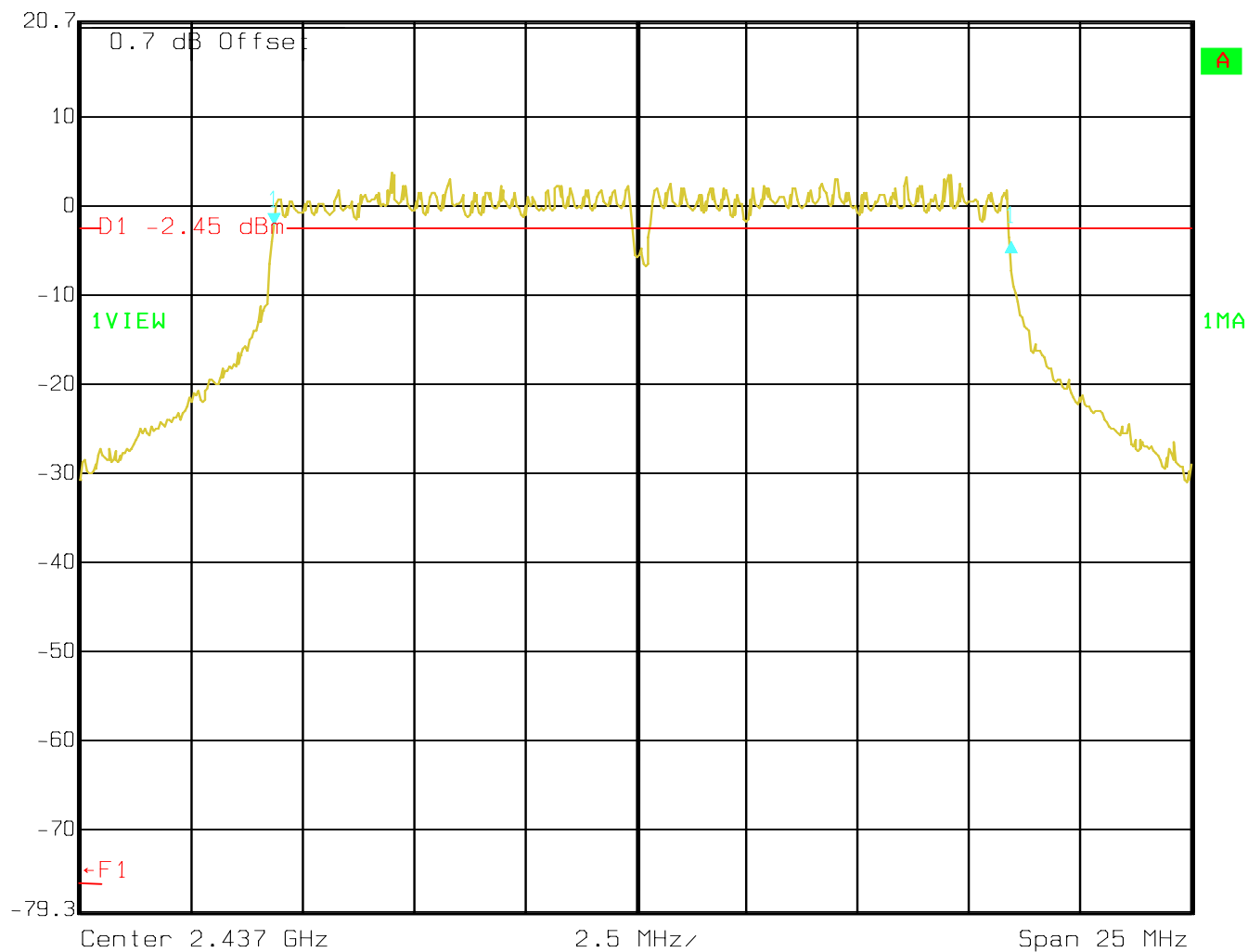
20.7 dBm

16.58316633 MHz

SWT 500 ms

Unit

dBm



Date: 31.JAN.2007 17:50:33

**SPECTRUM BANDWIDTH OF DSSS SYSTEM****§15.247(a) (2)****6 dB bandwidth****Highest Channel: 802.11g 2462MHz**

Delta 1 [T1]

RBW 100 kHz RF Att 50 dB

Ref Lvl -1.55 dB

VBW 100 kHz

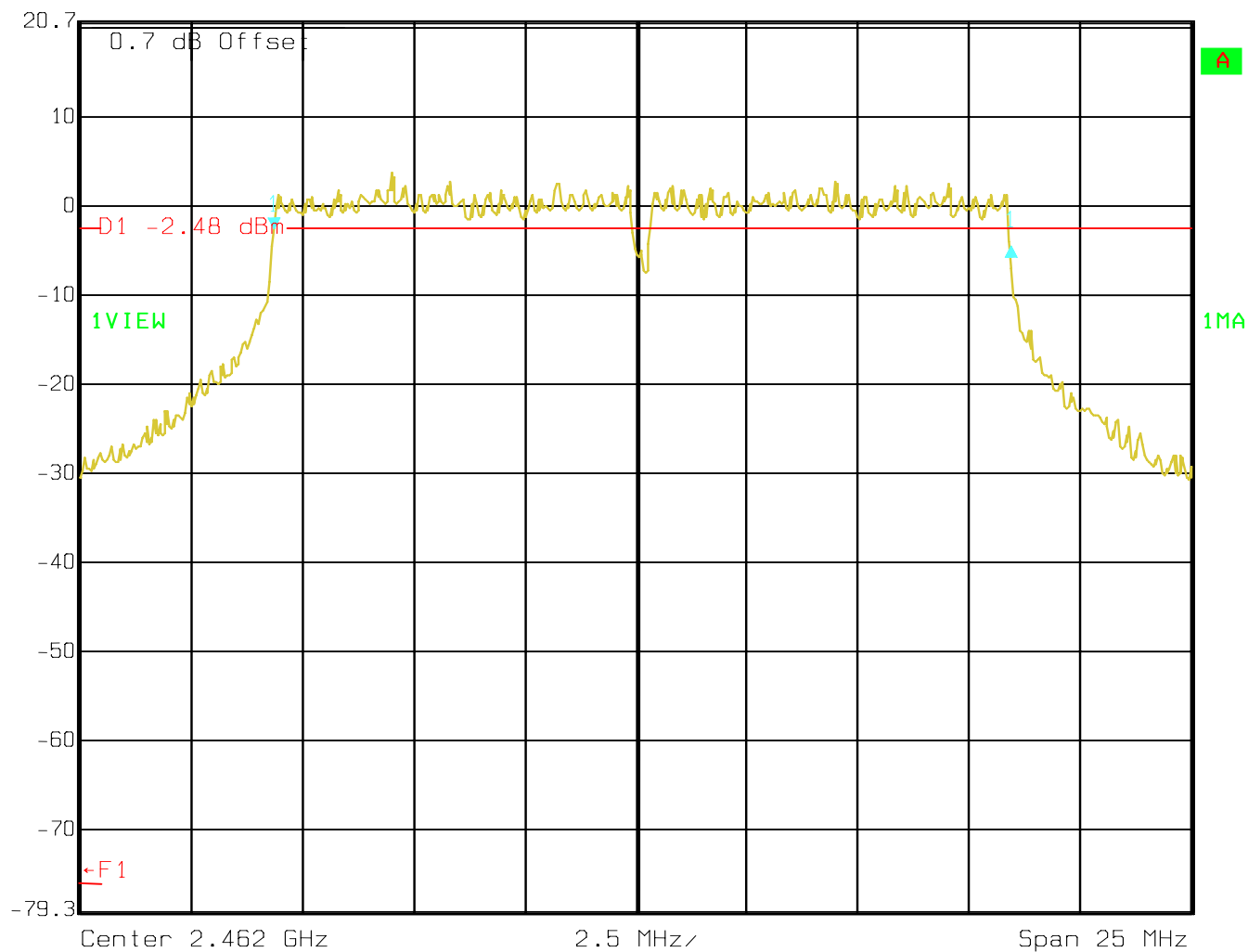
20.7 dBm

16.58316633 MHz

SWT 500 ms

Unit

dBm



Date: 31.JAN.2007 17:49:24



## 5.2 MAXIMUM PEAK OUTPUT POWER (Conducted)

§ 15.247 (b) (1)

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)			
Frequency (MHz)		2412		2441	2462
T <sub>nom</sub> (23)°C	V <sub>nom</sub> (4.2) VDC	802.11b	24.90	26.30	26.18
		802.11g	27.51	27.02	27.02
Measurement uncertainty		±0.5dBm			

RBW / VBW: 10MHz

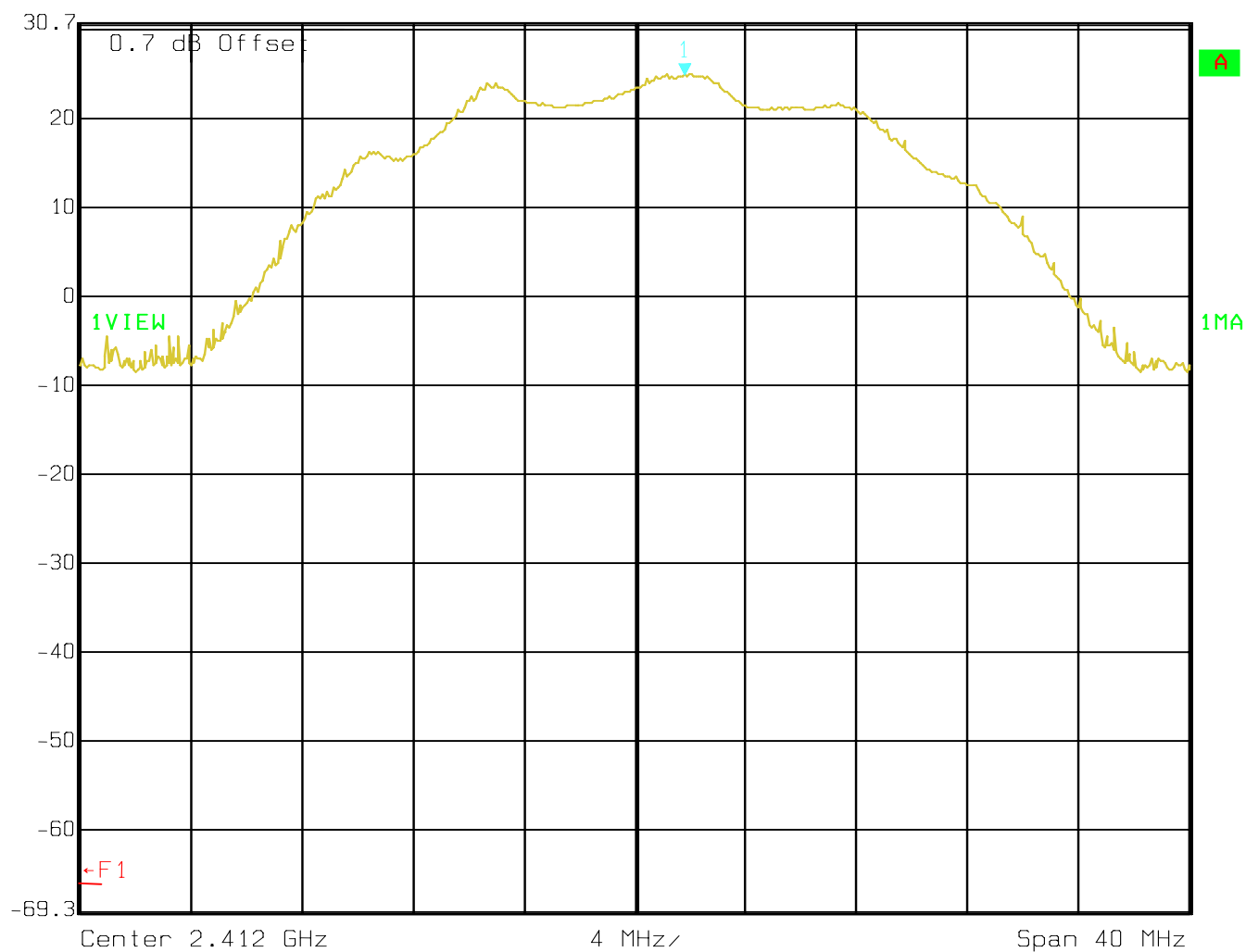
### 5.2.1 Limit

SUBCLAUSE § 15.247 (b) (1)

Frequency range	RF power output
2400-2483.5 MHz	1.0 Watt / 30dBm

**5.2.2 Results****PEAK OUTPUT POWER (CONDUCTED)****§15.247 (b) (1)****Lowest Channel: 802.11b 2412MHz**

Marker 1 [T1] RBW 10 MHz RF Att 60 dB  
Ref Lvl 24.90 dBm VBW 10 MHz  
30.7 dBm 2.41380361 GHz SWT 500 ms Unit dBm



Date: 31.JAN.2007 17:43:25



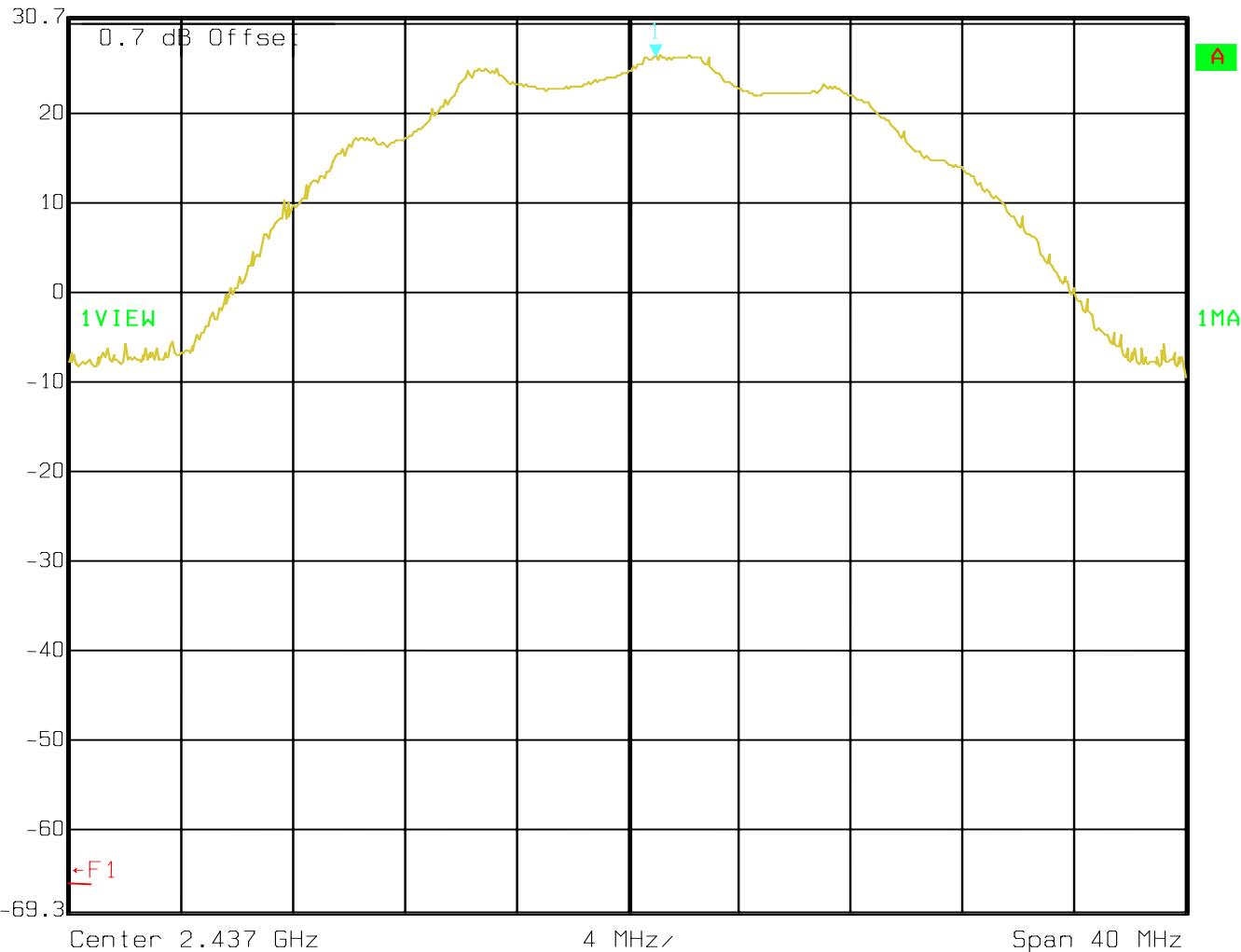
PEAK OUTPUT POWER (CONDUCTED)

§15.247 (b)

Mid Channel: 802.11b 2437MHz



Ref Lvl 30.7 dBm  
Marker 1 [T1] 26.30 dBm  
RBW 10 MHz RF Att 60 dB  
VBW 10 MHz  
SWT 500 ms Unit dBm  
2.43800200 GHz



Date: 31.JAN.2007 17:44:29

**PEAK OUTPUT POWER (CONDUCTED)****§15.247 (b)****Highest Channel: 802.11b 2462MHz**

Ref Lvl

30.7 dBm

Marker 1 [T1]

26.18 dBm

2.46324248 GHz

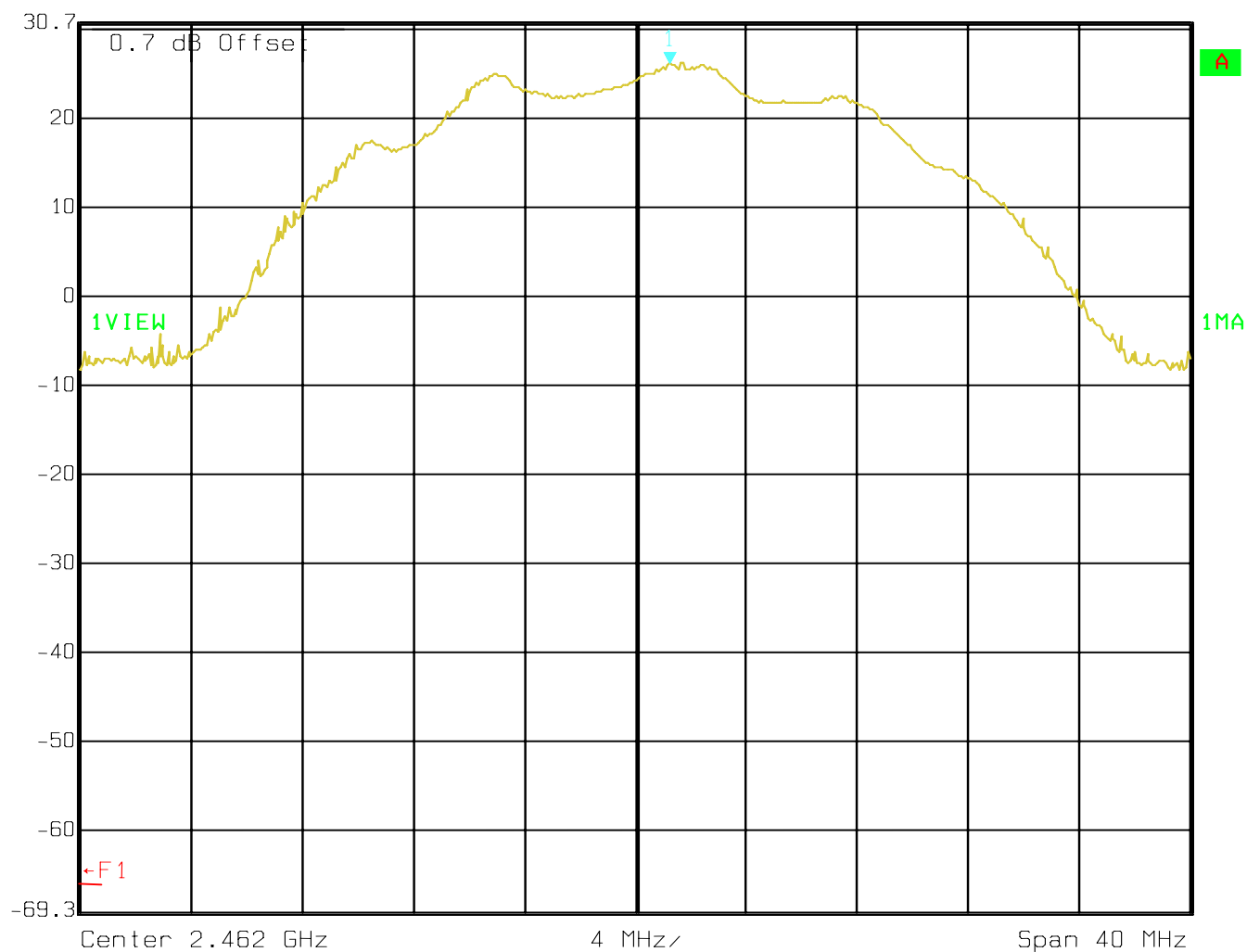
RBW 10 MHz

VBW 10 MHz

SWT 500 ms

RF Att 60 dB

Unit dBm

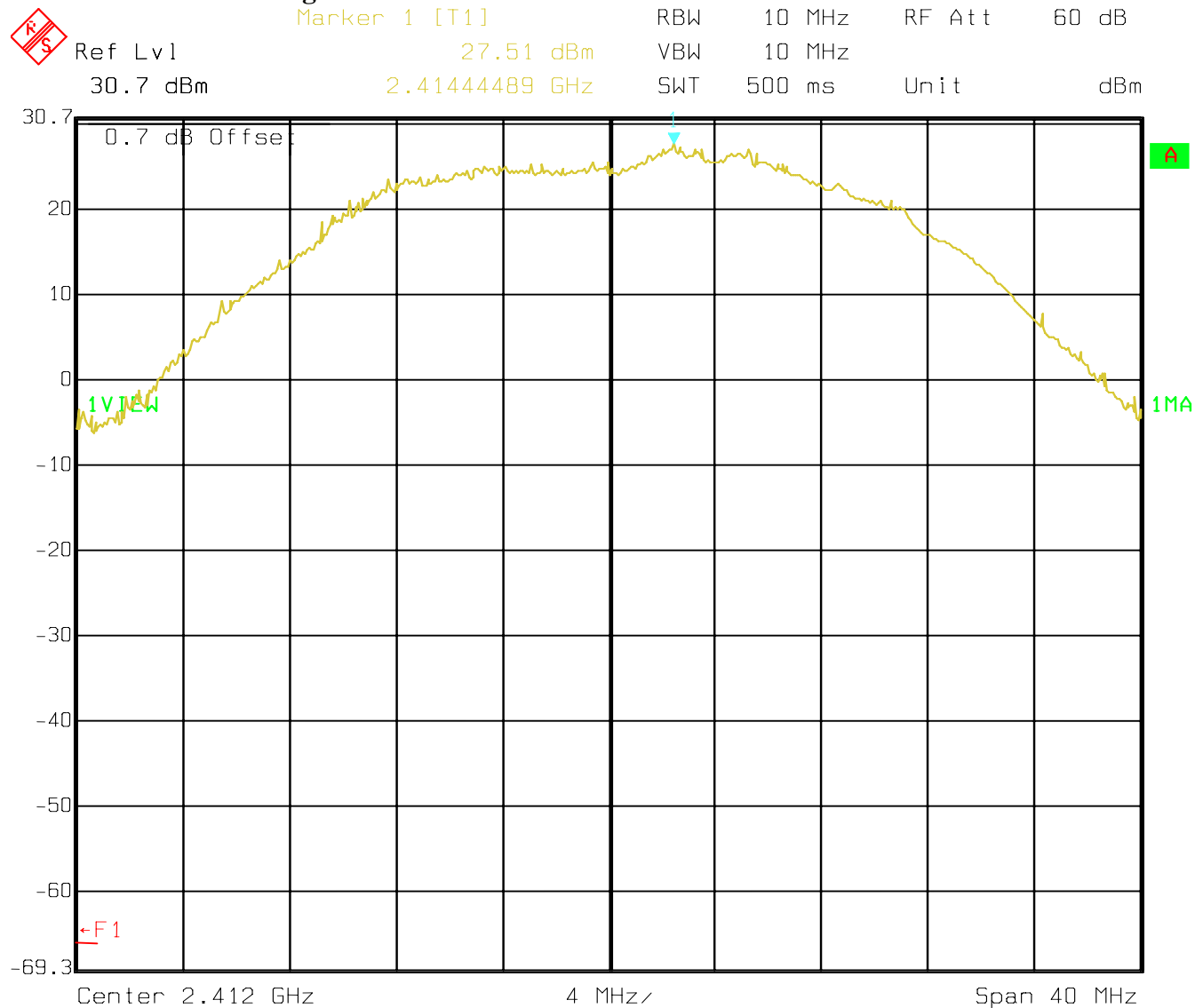


Date: 31.JAN.2007 17:46:06

### PEAK OUTPUT POWER (CONDUCTED)

**§15.247 (b) (1)**

**Lowest Channel: 802.11g 2412MHz**

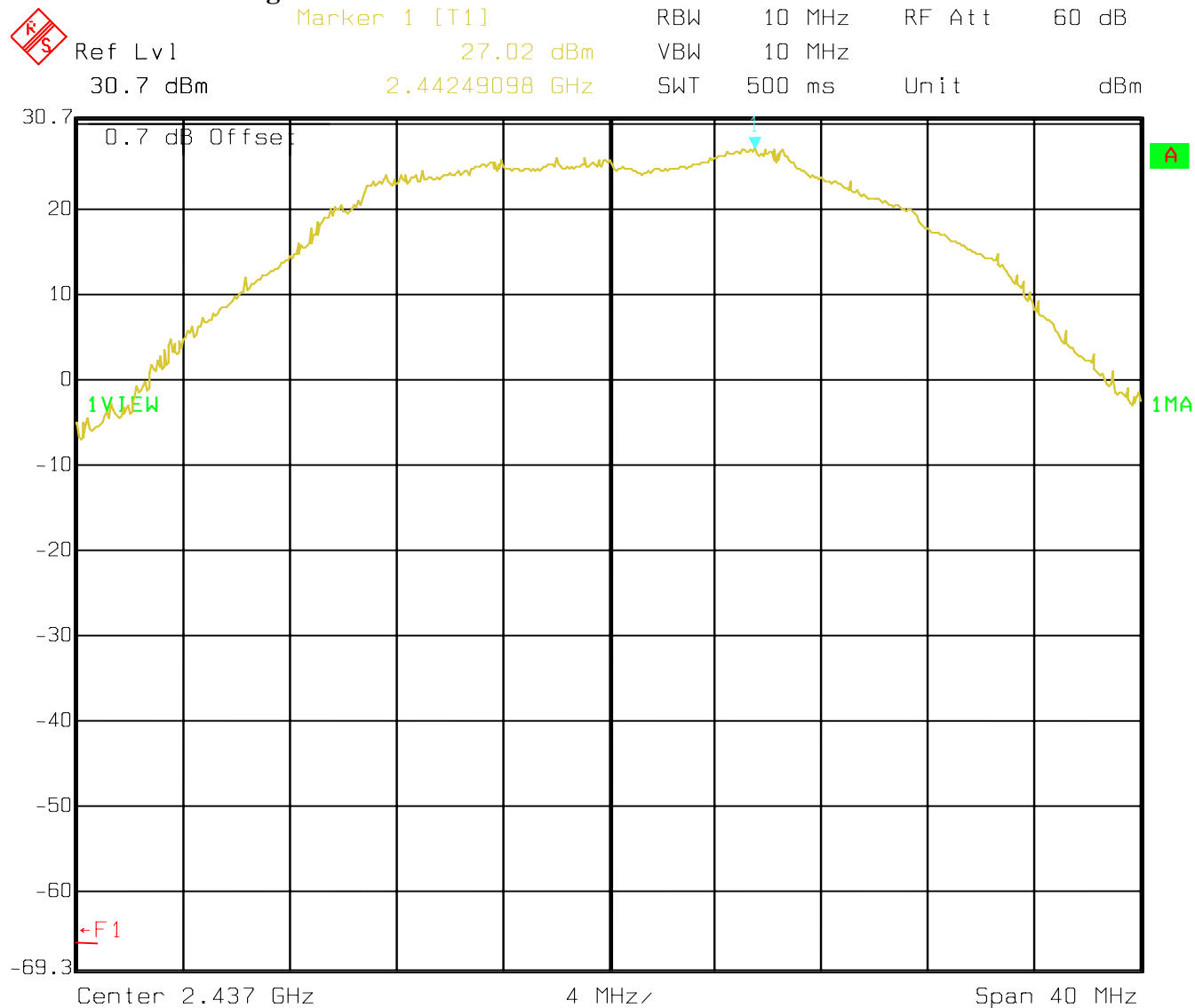


Date: 31.JAN.2007 17:42:21

### PEAK OUTPUT POWER (CONDUCTED)

**§15.247 (b)**

**Mid Channel: 802.11g 2437MHz**



Date: 31.JAN.2007 17:45:00

**PEAK OUTPUT POWER (CONDUCTED)****§15.247 (b)****Highest Channel: 802.11g 2462MHz**

Ref Lvl

30.7 dBm

Marker 1 [T1]

27.02 dBm

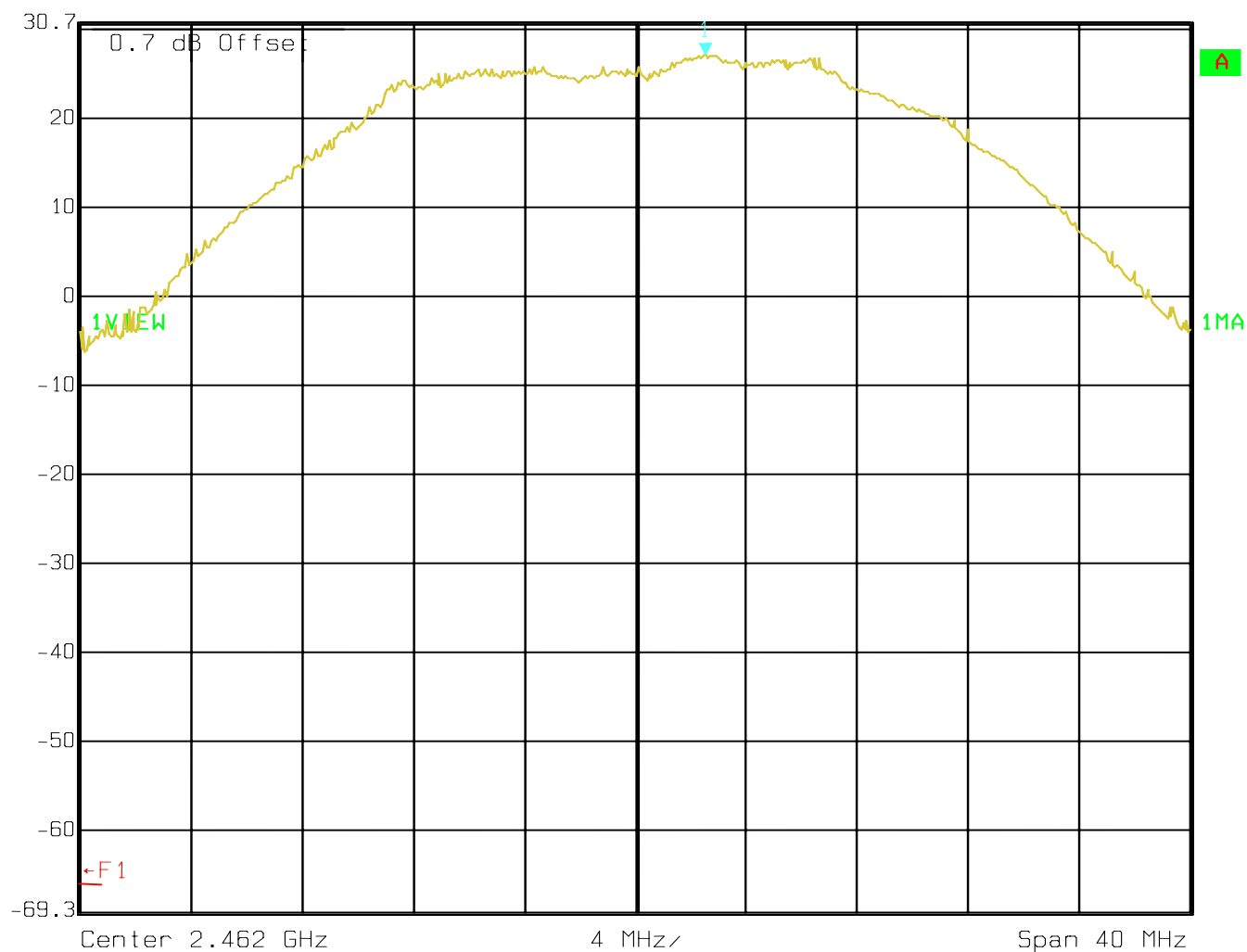
RBW 10 MHz

VBW 10 MHz

SWT 500 ms

RF Att 60 dB

Unit dBm



Date: 31.JAN.2007 17:45:28

**5.3 POWER SPECTRAL DENSITY****§15.247 (d)**

TEST CONDITIONS			POWER SPECTRAL DENSITY (dBm)		
	Frequency (MHz)		2412	2437	2462
802.11b	T <sub>nom</sub> (23) °C	V <sub>nom</sub> (4.2) VDC	-6.46	-4.83	-5.14
802.11g	T <sub>nom</sub> (23) °C	V <sub>nom</sub> (4.2) VDC	-12.56	-11.67	-11.71

**5.3.1 Limit****SUBCLAUSE §15.247(d)**

**The peak power spectral density shall not be greater than 8 dBm in any 3 kHz band**

**ANALYZER SETTINGS: RBW=3KHz, VBW=3KHz**

**5.3.2 Results****POWER SPECTRAL DENSITY****§15.247(d)****Lowest Channel: 802.11b (2412MHz)**

Marker 1 [T1]

RBW 3 kHz RF Att 40 dB

Ref Lvl

-6.46 dBm

VBW 3 kHz

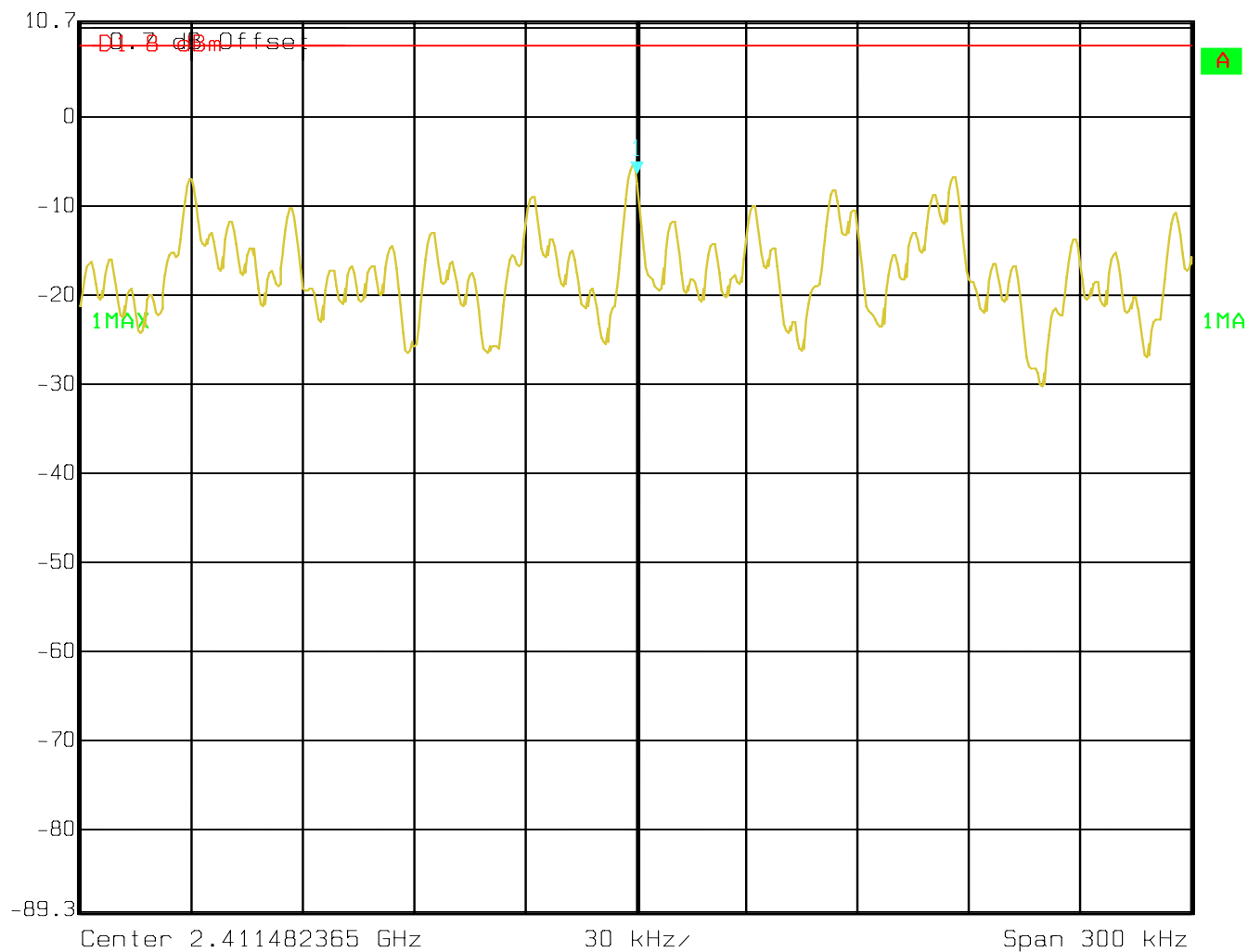
10.7 dBm

2.41148236 GHz

SWT 100 s

Unit

dBm



Date: 31.JAN.2007 18:28:11

**POWER SPECTRAL DENSITY**

§15.247(d)

**Mid Channel: 802.11b (2437MHz)**



Ref Lvl

10.7 dBm

Marker 1 [T1]

-4.83 dBm

2.43648327 GHz

RBW

3 kHz

RF Att

40 dB

VBW

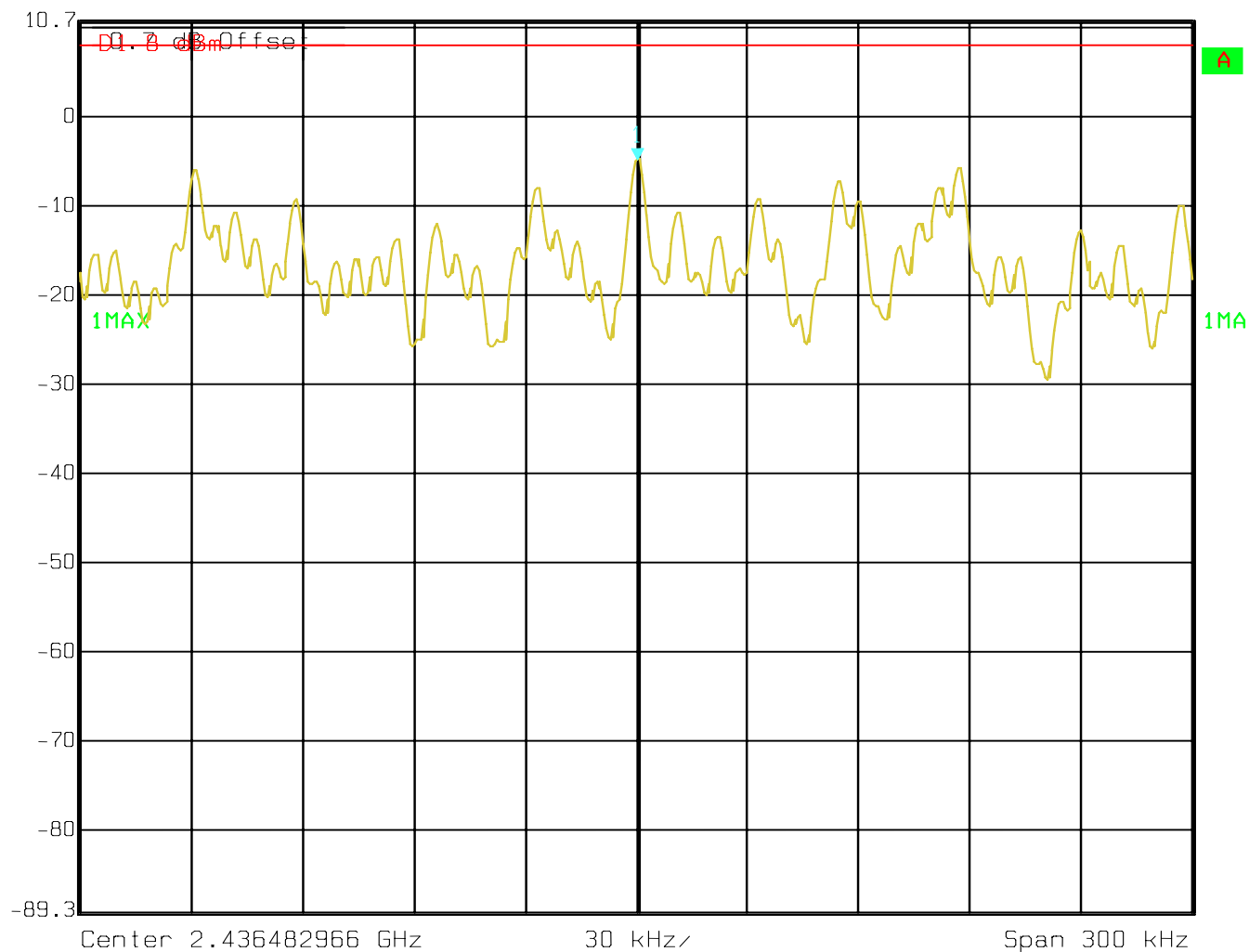
3 kHz

SWT

100 s

Unit

dBm



Date: 31.JAN.2007 18:24:31

**POWER SPECTRAL DENSITY**

§15.247(d)

**Highest Channel: 802.11b(2462MHz)**

Ref Lvl

10.7 dBm

Marker 1 [T1]

-5.14 dBm

2.46088406 GHz

RBW

3 kHz

RF Att

40 dB

VBW

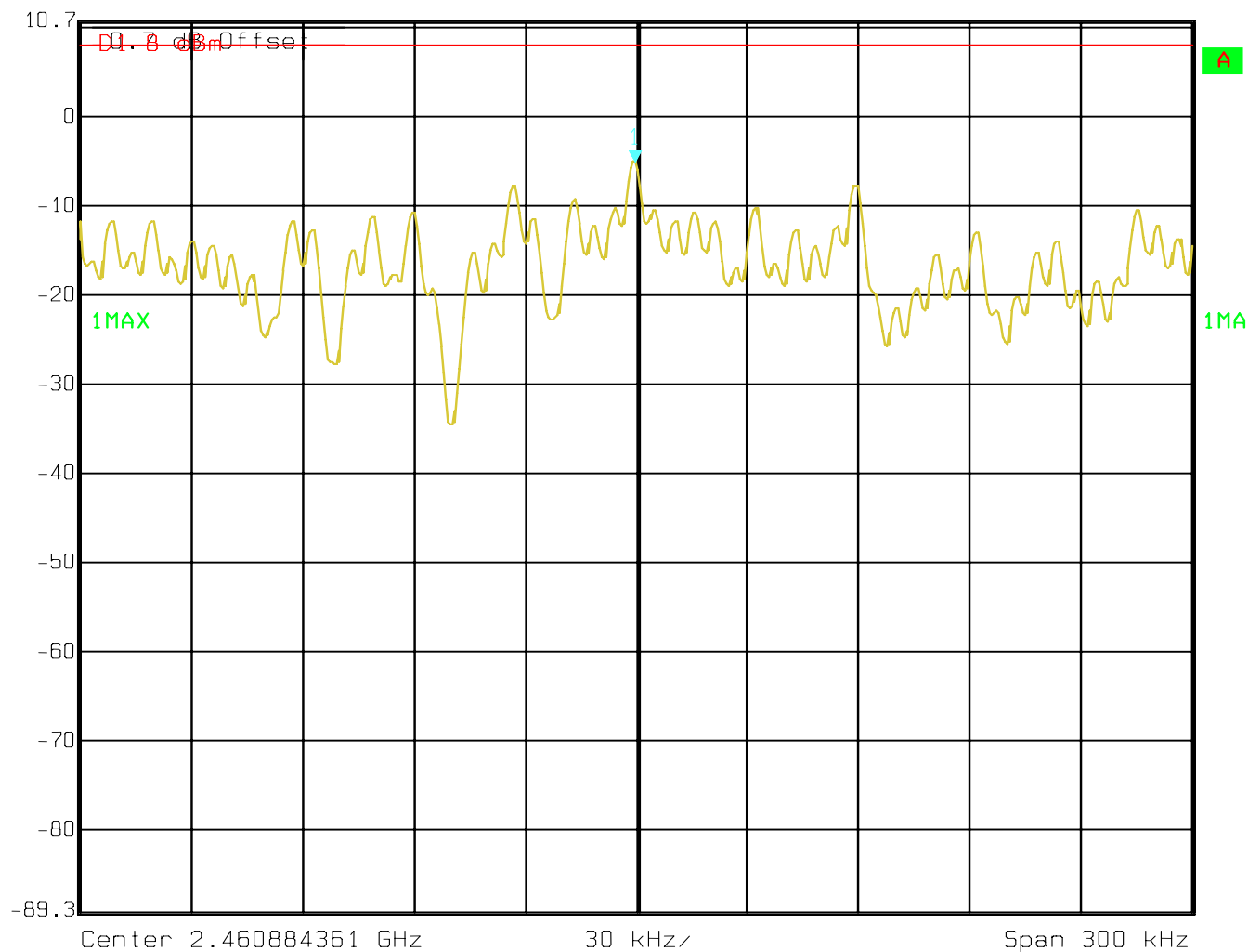
3 kHz

SWT

100 s

Unit

dBm



Date: 31.JAN.2007 18:20:26

**POWER SPECTRAL DENSITY****§15.247(d)****Lowest Channel: 802.11g (2412MHz)**

Ref Lvl

10.7 dBm

Marker 1 [T1]

-12.56 dBm

2.41652263 GHz

RBW

3 kHz

RF Att

40 dB

VBW

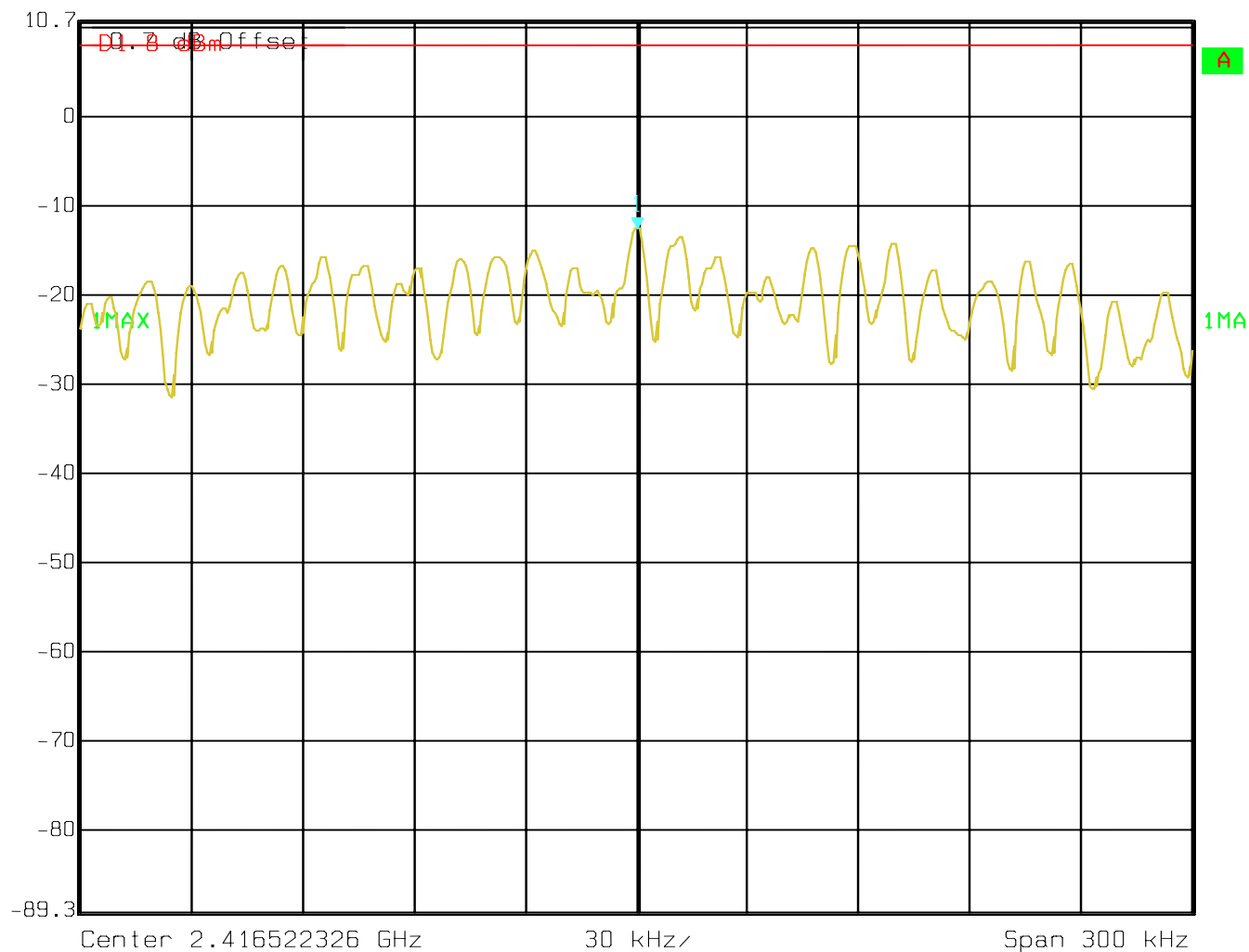
3 kHz

SWT

100 s

Unit

dBm



Date: 31.JAN.2007 18:08:58



# POWER SPECTRAL DENSITY

§15.247(d)

Mid Channel: 802.11g (2437MHz)



Ref Lvl

10.7 dBm

Marker 1 [T1]

-11.67 dBm

2.44152435 GHz

RBW

3 kHz

RF Att

40 dB

VBW

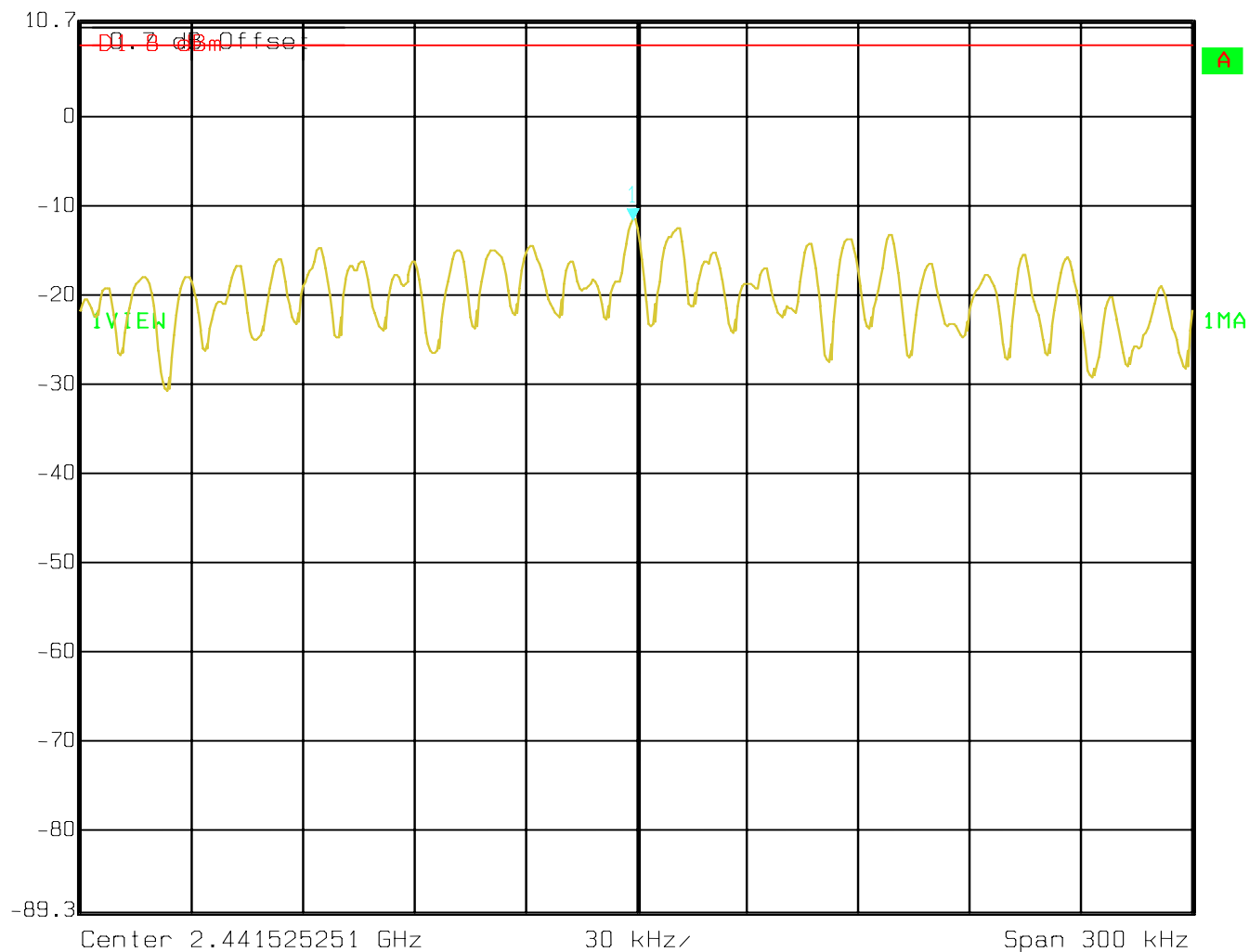
3 kHz

SWT

100 s

Unit

dBm



Date: 31.JAN.2007 18:13:00



# POWER SPECTRAL DENSITY

§15.247(d)

Highest Channel: 802.11g (2462MHz)



Ref Lvl

10.7 dBm

Marker 1 [T1]

-11.71 dBm

2.46652675 GHz

RBW

3 kHz

RF Att

40 dB

VBW

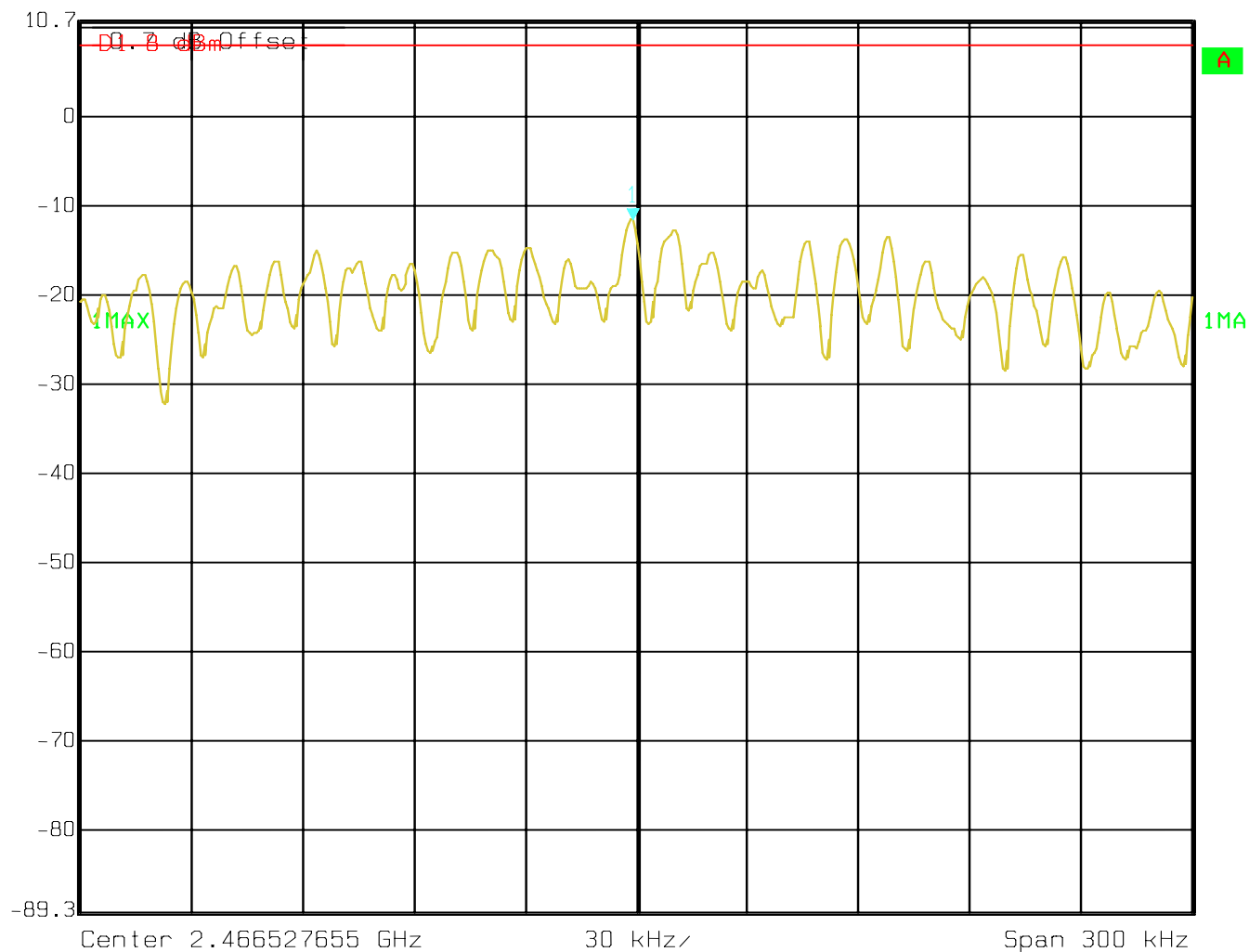
3 kHz

SWT

100 s

Unit

dBm



Date: 31.JAN.2007 18:16:19



## 5.4 RESTRICTED BAND EDGE COMPLIANCE RADIATED §15.247/15.205

### 5.4.1 LIMITS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
<sup>1</sup> 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	( <sup>2</sup> )
13.36 - 13.41			

\*PEAK LIMIT= 74dBuV/m

\*AVG. LIMIT= 54dBuV/m

#### Notes:

1. Radiated emissions are maximized by rotating the EUT 360° at 0.5 meter height increments between 1 and 4 meters.
2. Measurements were performed with the EUT in X, Y and Z orientations with the measurement antenna in both horizontal and vertical polarity. The plots below show the results of the worst case orientation and polarity.

**5.4.2 Results Lower Restricted Band 2310 MHz to 2390 MHz****802.11b (2412MHz) PEAK****CETECOM Inc.****411 Dixon Landing Road, Milpitas CA 95035, USA**

Test Mode: WLAN-CCK, ch1

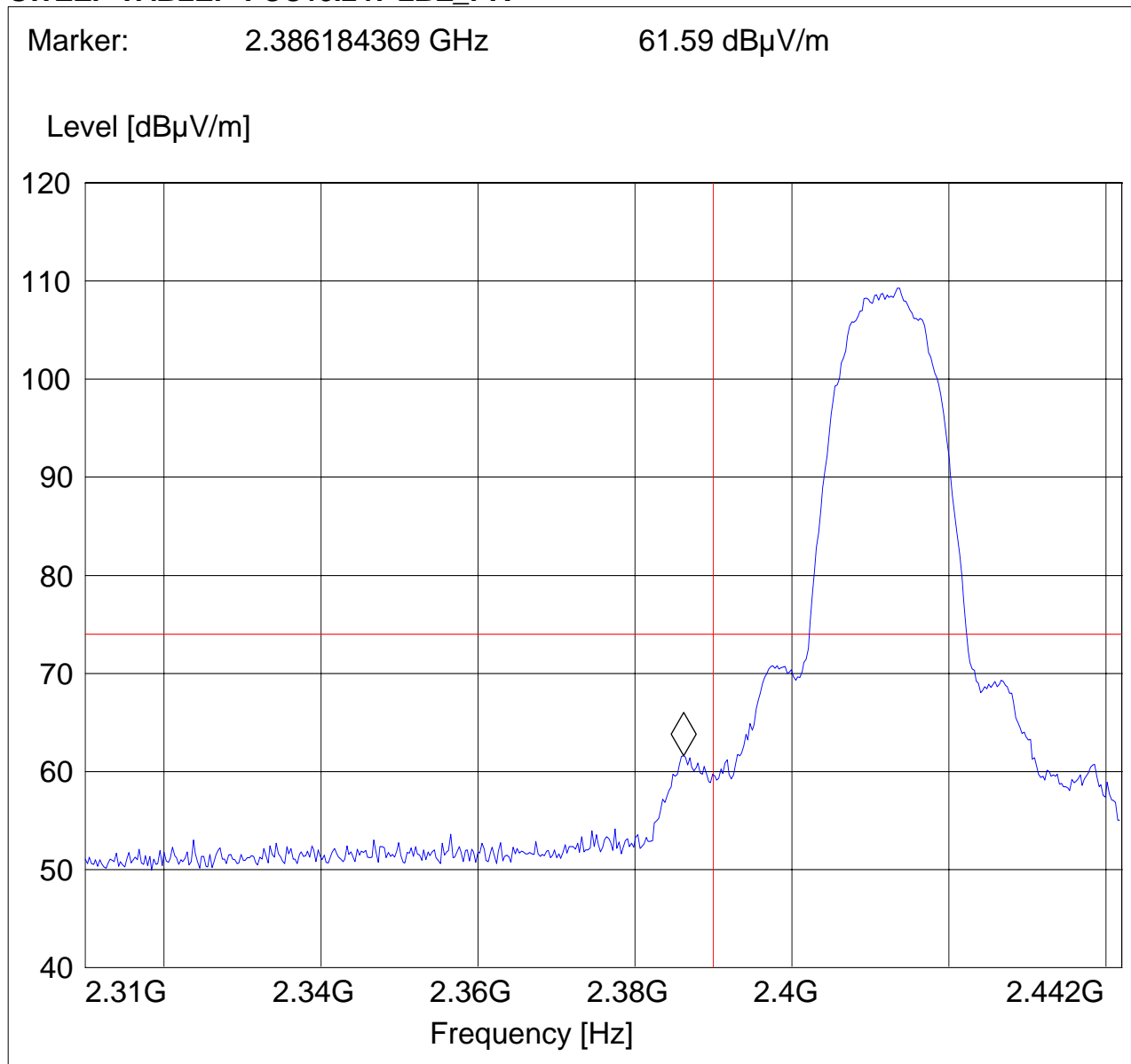
Ant Orientation: V

EUT Orientation: +45° from horizontal

Test Engineer: Ed

Voltage:: Battery

Comments:: maximized Peak

**SWEEP TABLE: "FCC15.247 LBE\_PK"**

**802.11b (2412MHz) AVG****CETECOM Inc.****411 Dixon Landing Road, Milpitas CA 95035, USA**

Test Mode: WLAN-CCK, ch1

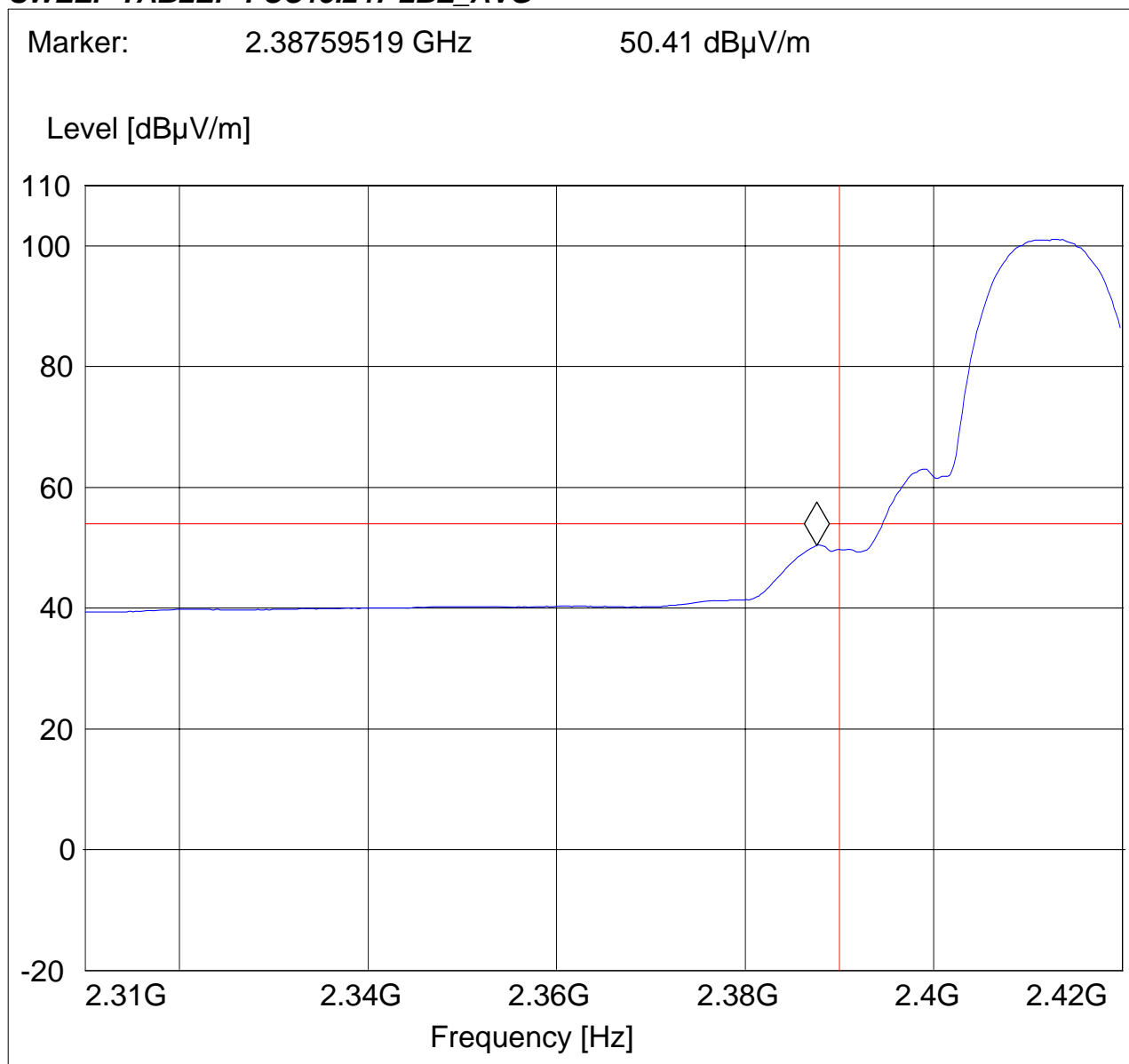
Ant Orientation: V

EUT Orientation: +45° from horizontal

Test Engineer: Ed

Voltage:: Battery

Comments:: maximized Average

***SWEEP TABLE: "FCC15.247 LBE\_AVG"***

**802.11g (2412MHz) PEAK****CETECOM Inc.****411 Dixon Landing Road, Milpitas CA 95035, USA**

Test Mode: WLAN-OFDM, ch1

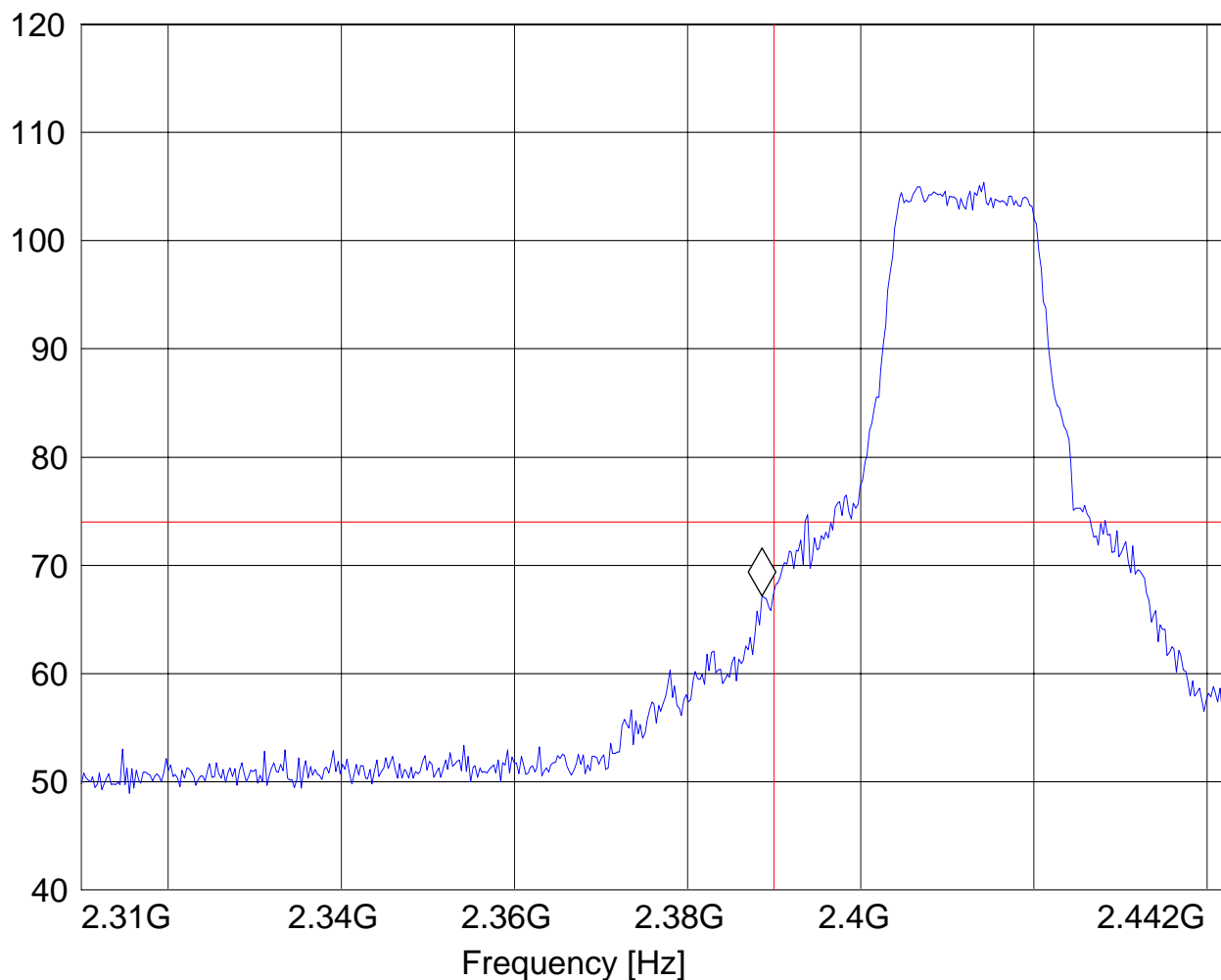
Ant Orientation: V

EUT Orientation: +45° from horizontal

Test Engineer: Ed

Voltage:: Battery

Comments:: maximized Peak

***SWEEP TABLE: "FCC15.247 LBE\_PK"***Marker: 2.38856513 GHz 67.14 dB $\mu$ V/mLevel [dB $\mu$ V/m]

**802.11g (2412MHz) AVG****CETECOM Inc.****411 Dixon Landing Road, Milpitas CA 95035, USA**

Test Mode: WLAN-OFDM, ch1

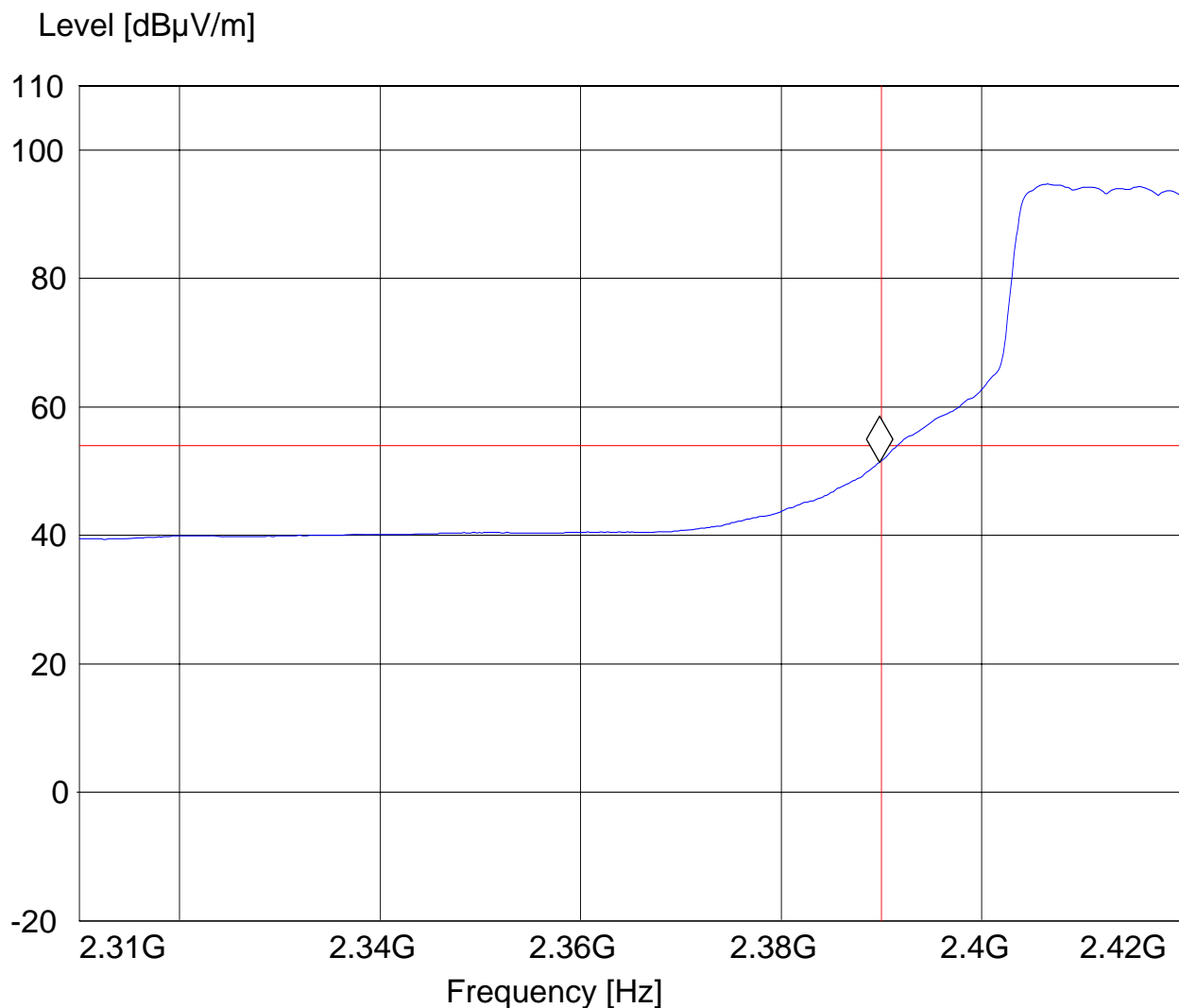
Ant Orientation: V

EUT Orientation: +45° from horizontal

Test Engineer: Ed

Voltage:: Battery

Comments:: maximized Average

***SWEEP TABLE: "FCC15.247 LBE\_AVG"***Marker: 2.389799599 GHz 51.42 dB $\mu$ V/m

**5.4.3 Results Upper Restricted Band 2483.5 MHz to 2500 MHz****802.11b (2462MHz) PEAK****CETECOM Inc.****411 Dixon Landing Road, Milpitas CA 95035, USA**

Test Mode: WLAN-CCK, ch11

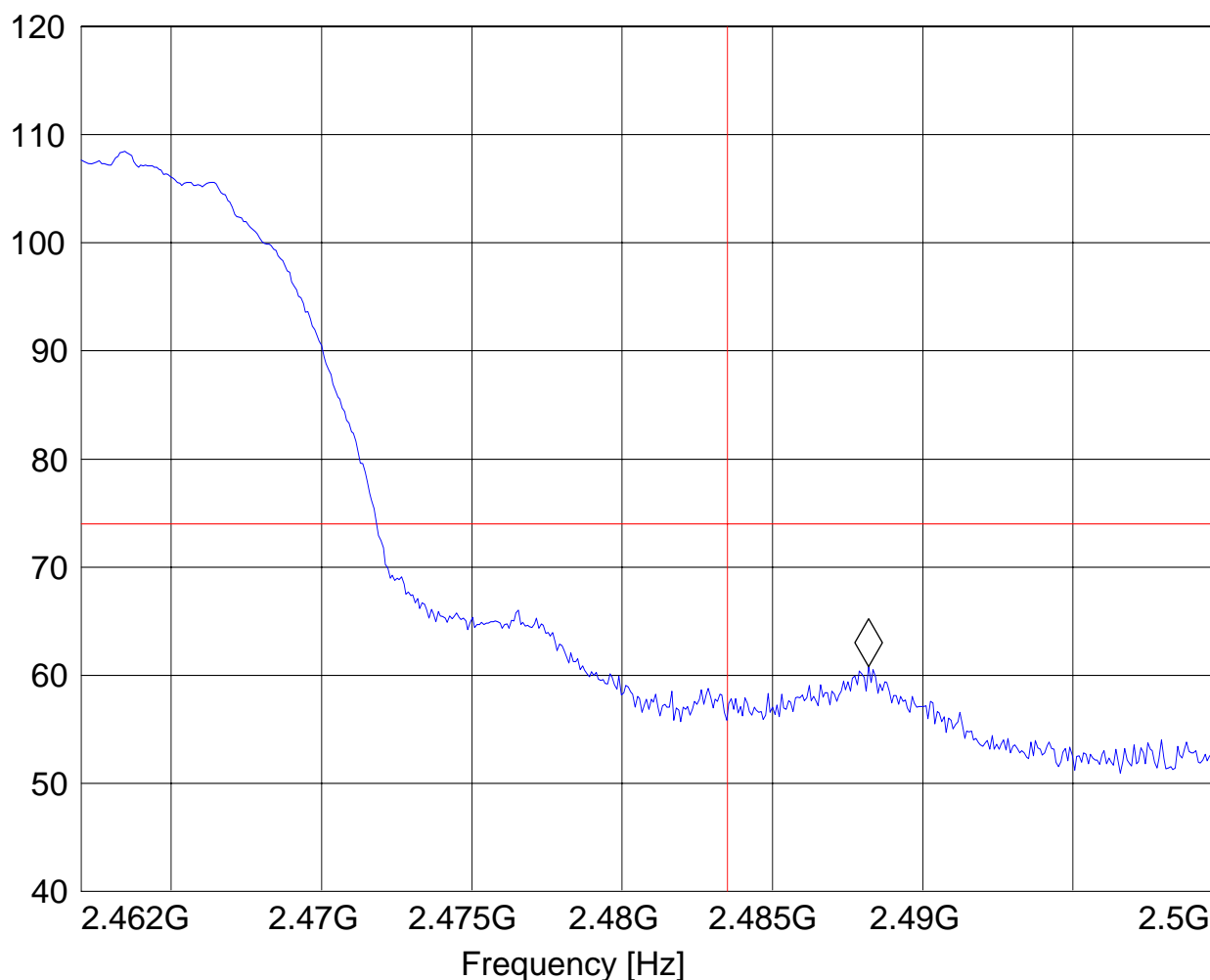
Ant Orientation: V

EUT Orientation: +45° from horizontal

Test Engineer: Ed

Voltage:: Battery

Comments:: maximized Peak

***SWEEP TABLE: "FCC15.247 HBE\_PK"***Marker: 2.488196393 GHz 60.79 dB $\mu$ V/mLevel [dB $\mu$ V/m]

**802.11b (2462MHz) AVG****CETECOM Inc.****411 Dixon Landing Road, Milpitas CA 95035, USA**

Test Mode: WLAN-CCK, ch11

Ant Orientation: V

EUT Orientation: +45° from horizontal

Test Engineer: Ed

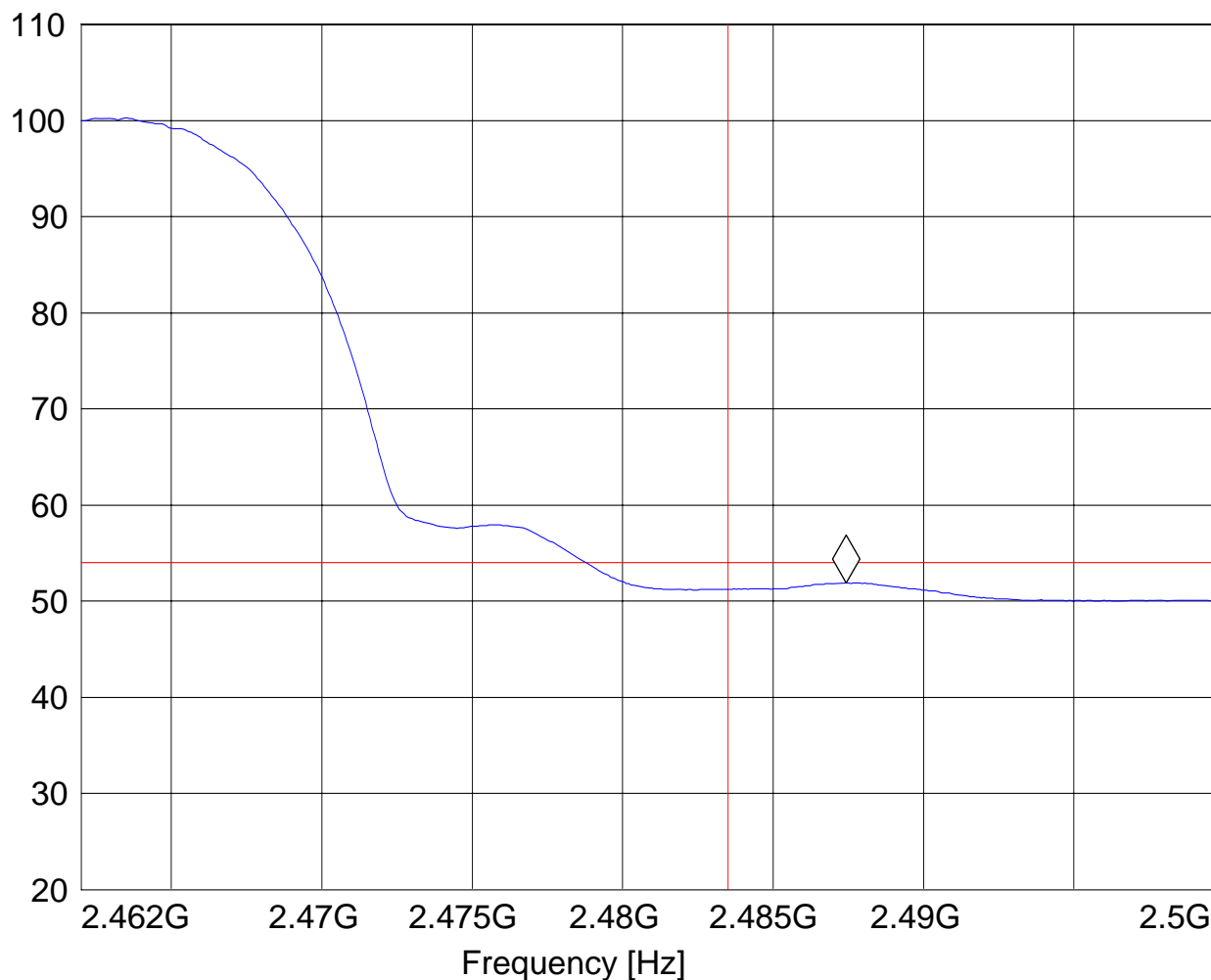
Voltage:: Battery

Comments:: maximized Average

***SWEEP TABLE: "FCC15.247 HBE\_AVG"***

Marker: 2.48743487 GHz 51.9 dBμV/m

Level [dBμV/m]



**802.11g (2462MHz) PEAK****CETECOM Inc.****411 Dixon Landing Road, Milpitas CA 95035, USA**

Test Mode: WLAN-OFDM, ch11

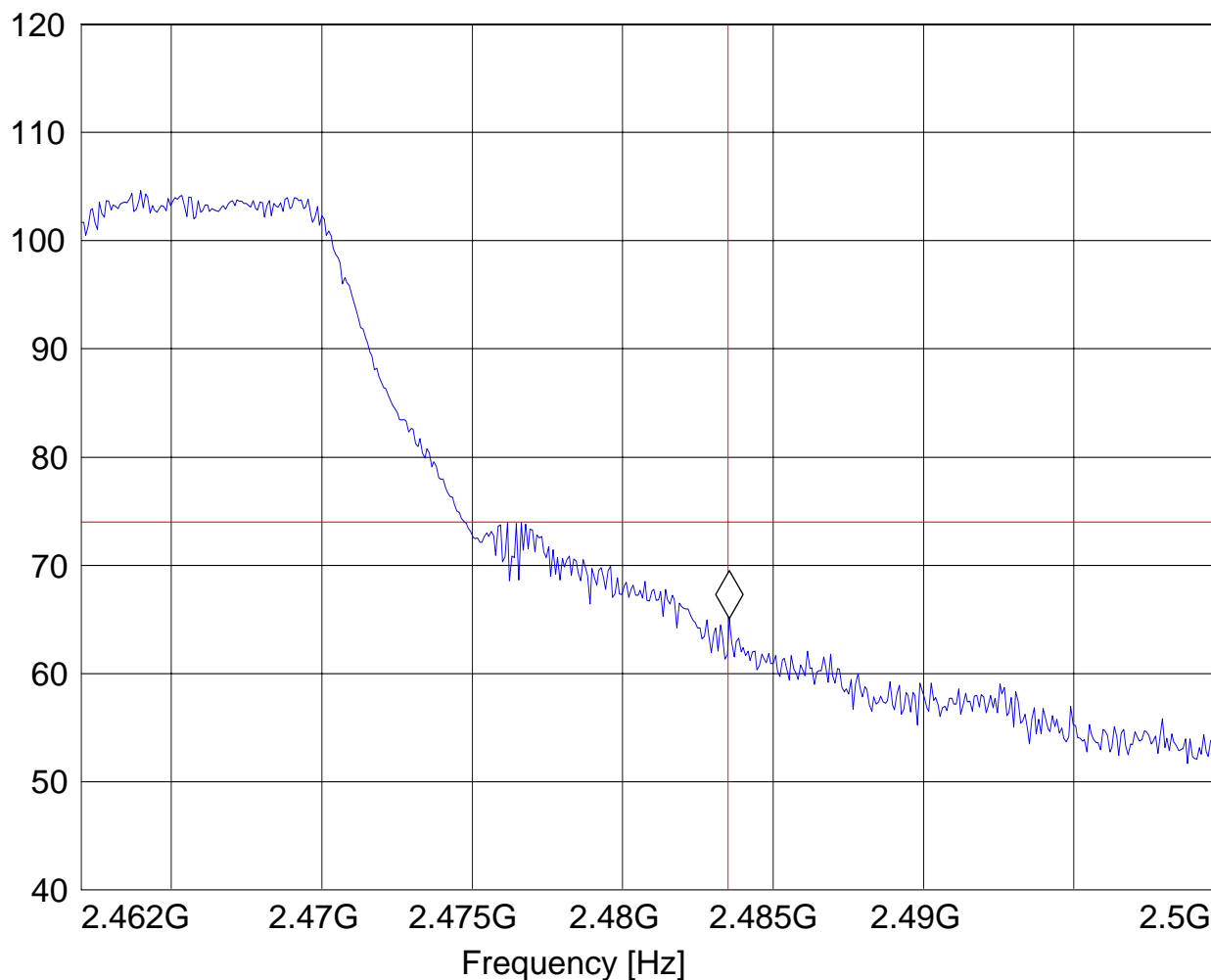
Ant Orientation: V

EUT Orientation: +45° from horizontal

Test Engineer: Ed

Voltage:: Battery

Comments:: maximized Peak

***SWEEP TABLE: "FCC15.247 HBE\_PK"***Marker: 2.483551102 GHz 65.1 dB $\mu$ V/mLevel [dB $\mu$ V/m]

**802.11g (2462MHz) AVG****CETECOM Inc.****411 Dixon Landing Road, Milpitas CA 95035, USA**

Test Mode: WLAN-OFDM, ch11

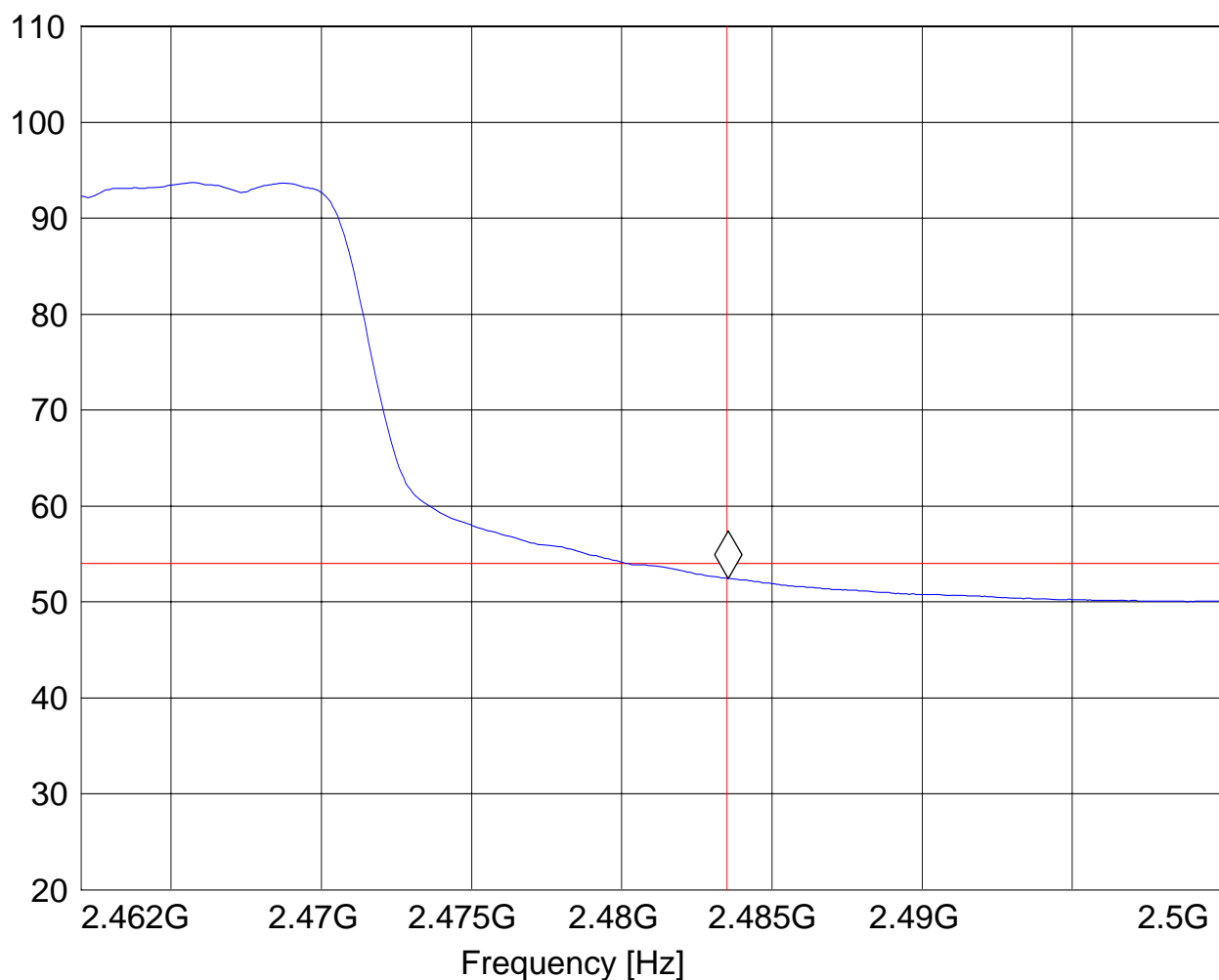
Ant Orientation: V

EUT Orientation: +45° from horizontal

Test Engineer: Ed

Voltage:: Battery

Comments:: maximized Average

***SWEEP TABLE: "FCC15.247 HBE\_AVG"***Marker: 2.483551102 GHz 52.45 dB $\mu$ V/mLevel [dB $\mu$ V/m]

## 5.5 TRANSMITTER SPURIOUS EMISSIONS RADIATED § 15.247/15.205/15.209

### 5.5.1 LIMITS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
<sup>1</sup> 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	( <sup>2</sup> )
13.36 - 13.41			

**\*PEAK LIMIT= 74dBuV/m**

**\*AVG. LIMIT= 54dBuV/m**

#### Notes:

1. The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 3 and 25 GHz very short cable connections to the antenna was used to minimize the noise level.
2. All measurements are done in peak mode using an average limit, unless specified with the plots.
3. Radiated emissions are maximized by rotating the EUT 360° at 0.5 meter height increments between 1 and 4 meters.
4. Measurements were performed with the EUT in X, Y and Z orientations with the measurement antenna in both horizontal and vertical polarity. The plots below show the results of the worst case orientation and polarity

#### Results for the radiated measurements below 30MHz according § 15.33

Frequency	Measured values	Remarks
9KHz – 30MHz	No emissions found, caused by the EUT	This is valid for all the tested channels



## 5.5.2 RESULTS

30MHz – 1GHz

Antenna: vertical

Note: This plot is valid for low, mid, high channels (worst-case plot)

**CETECOM Inc.**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

Test Mode: WLAN-ODFM

Ant Orientation: V

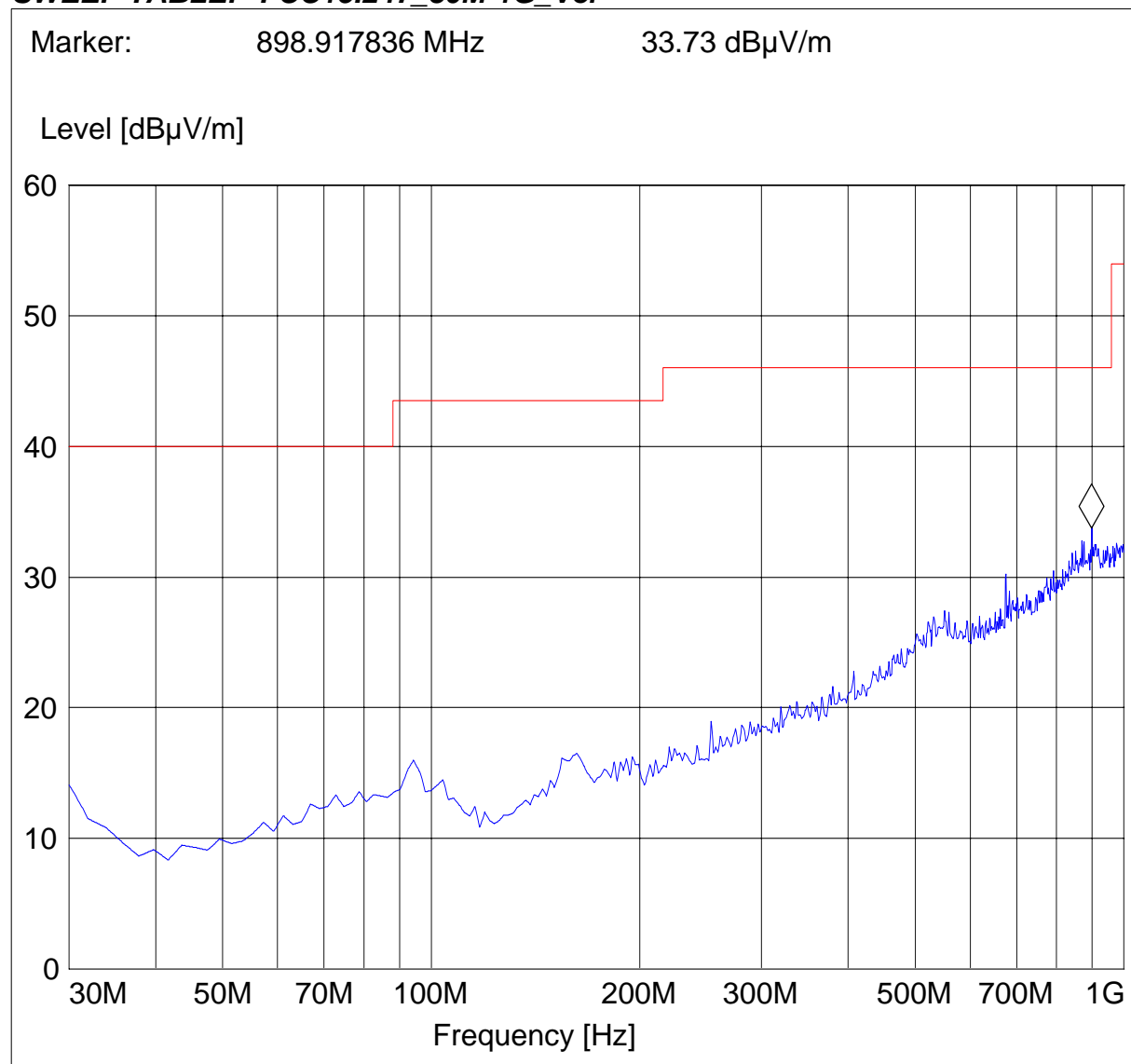
EUT Orientation: V

Test Engineer: Ed

Voltage:: Battery

Comments:: 360° rotation

### ***SWEEP TABLE: "FCC15.247\_30M-1G\_Ver"***



**30MHz – 1GHz****Antenna: horizontal****Note: This plot is valid for low, mid, high channels (worst-case plot)****CETECOM Inc.****411 Dixon Landing Road, Milpitas CA 95035, USA**

Test Mode: WLAN-ODFM

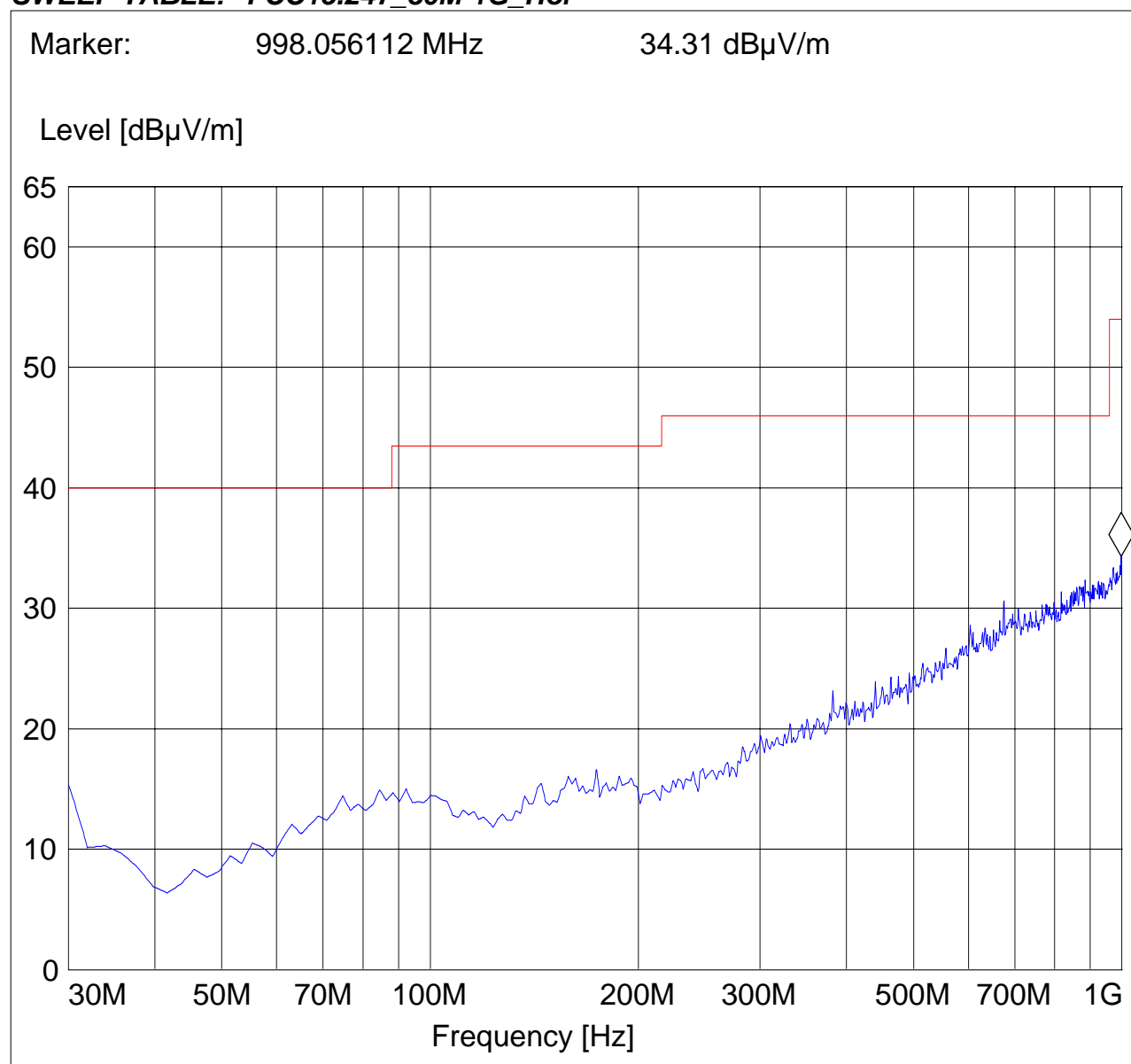
Ant Orientation: H

EUT Orientation: V

Test Engineer: Ed

Voltage:: Battery

Comments:: 360° rotation

***SWEEP TABLE: "FCC15.247\_30M-1G\_Hor"***

**1-3GHz (2412MHz)**

**Note: The peaks above the limit line is the carrier freq.**

**Note: Peak Reading vs. Average limit**

**CETECOM Inc.**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

Test Mode: WLAN-ODFM

Ant Orientation: V

EUT Orientation: V

Test Engineer: Ed

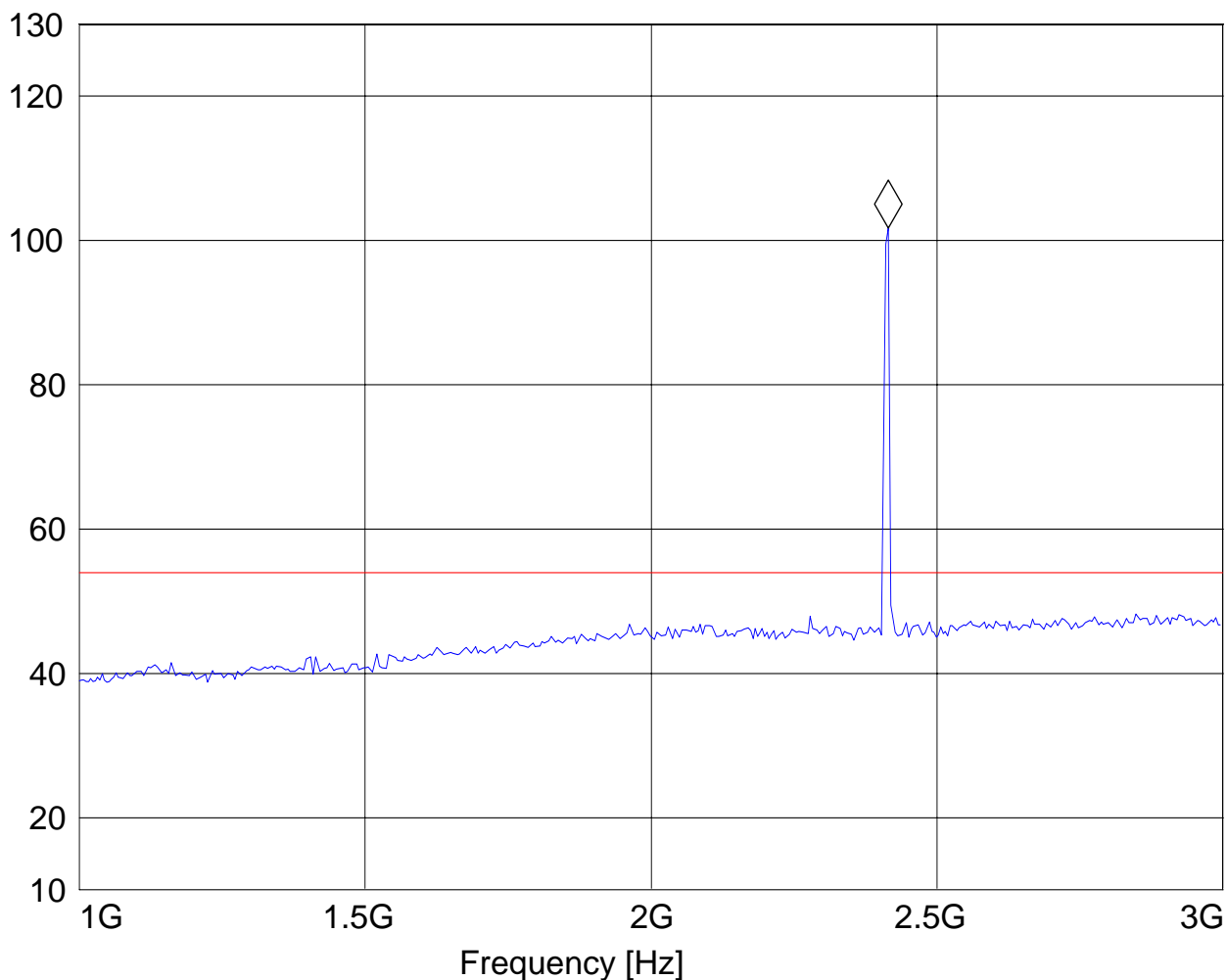
Voltage:: Battery

Comments:: 360° rotation, marker on tch sig.

***SWEEP TABLE: "FCC15.247\_1-3G"***

Marker: 2.414829659 GHz 101.75 dB $\mu$ V/m

Level [dB $\mu$ V/m]



**1-3GHz (2437MHz)**

**Note: The peaks above the limit line is the carrier freq.**

**Note: Peak Reading vs. Average limit**

**CETECOM Inc.**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

Test Mode: WLAN-ODFM

Ant Orientation: V

EUT Orientation: V

Test Engineer: Ed

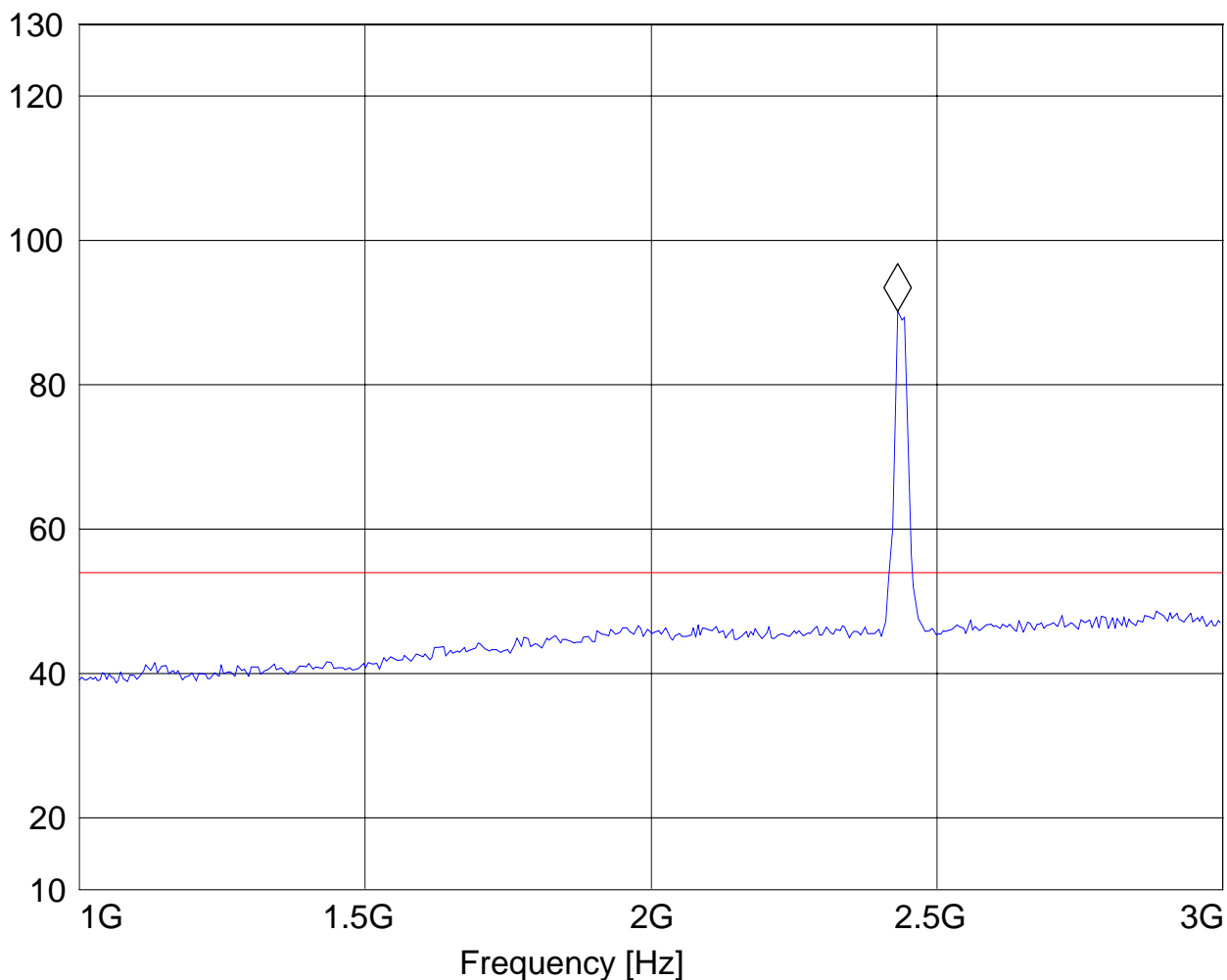
Voltage:: Battery

Comments:: 360°rotation

***SWEEP TABLE: "FCC15.247\_1-3G"***

Marker: 2.430861723 GHz 90.14 dB $\mu$ V/m

Level [dB $\mu$ V/m]



**1-3GHz (2462MHz)**

**Note: The peaks above the limit line is the carrier freq.**

**Note: Peak Reading vs. Average limit**

**CETECOM Inc.**

**411 Dixon Landing Road, Milpitas CA 95035, USA**

Test Mode: WLAN-ODFM

Ant Orientation: V

EUT Orientation: V

Test Engineer: Ed

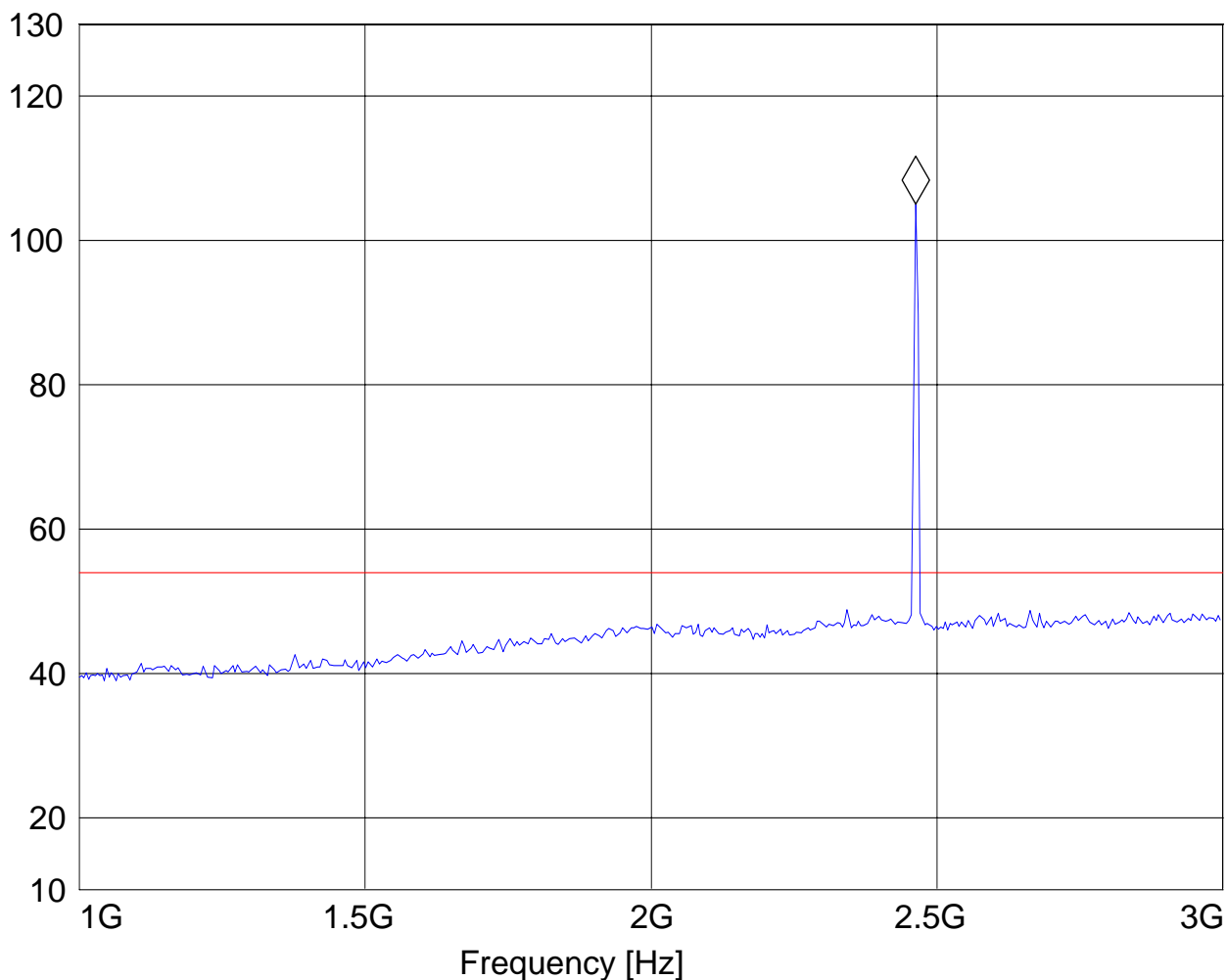
Voltage:: Battery

Comments:: 360° rotation, marker is on tch sig.

***SWEEP TABLE: "FCC15.247\_1-3G"***

Marker: 2.462925852 GHz 105.01 dB $\mu$ V/m

Level [dB $\mu$ V/m]



**3-18GHz (2412MHz)****Note: Peak Reading vs. Average limit****CETECOM Inc.****411 Dixon Landing Road, Milpitas CA 95035, USA**

Test Mode: WLAN-OFDM

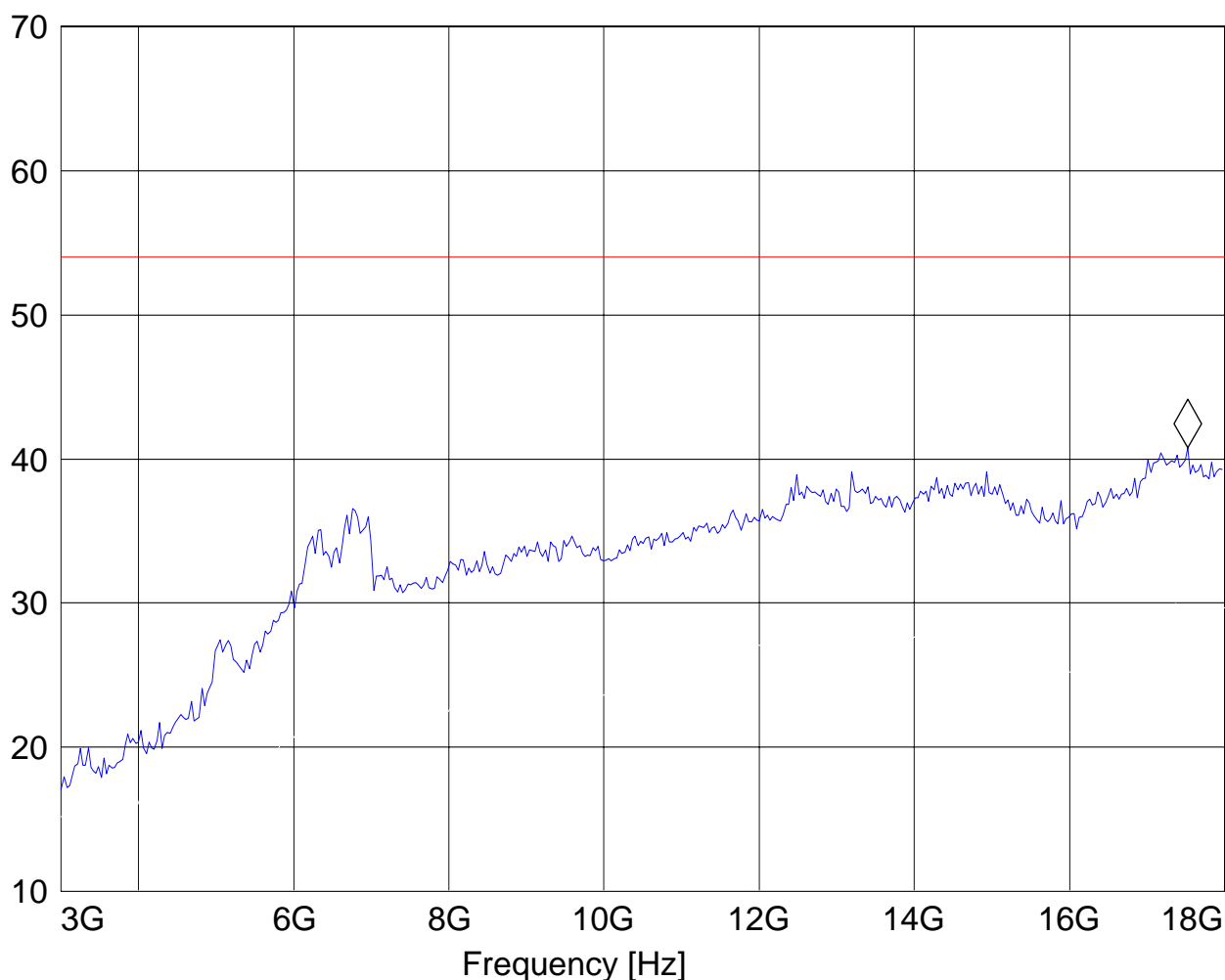
Ant Orientation: V

EUT Orientation: V

Test Engineer: Ed

Voltage:: Battery

Comments:: 360° rotation

**SWEEP TABLE: "FCC15.247\_3-18G"**Marker: 17.523046092 GHz 40.8 dB $\mu$ V/mLevel [dB $\mu$ V/m]

**3-18GHz (2437MHz)****Note: Peak Reading vs. Average limit****CETECOM Inc.****411 Dixon Landing Road, Milpitas CA 95035, USA**

Test Mode: WLAN-ODFM

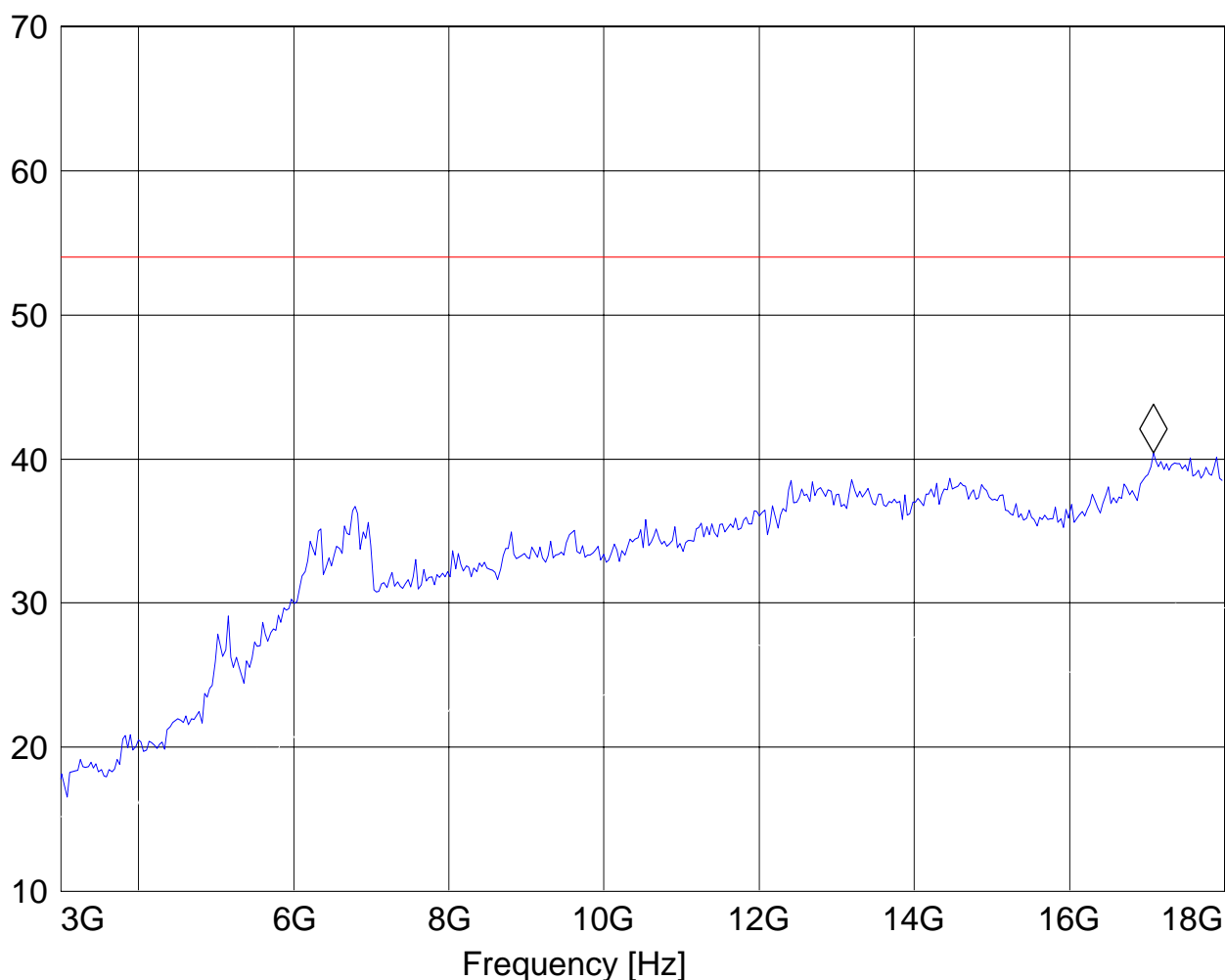
Ant Orientation: V

EUT Orientation: V

Test Engineer: Ed

Voltage:: Battery

Comments:: 360°rotation

**SWEEP TABLE: "FCC15.247\_3-18G"**Marker: 17.080160321 GHz 40.42 dB $\mu$ V/mLevel [dB $\mu$ V/m]

**3-18GHz (2462MHz)****Note: Peak Reading vs. Average limit****CETECOM Inc.****411 Dixon Landing Road, Milpitas CA 95035, USA**

Customer:: ACI

Test Mode: WLAN-ODFM

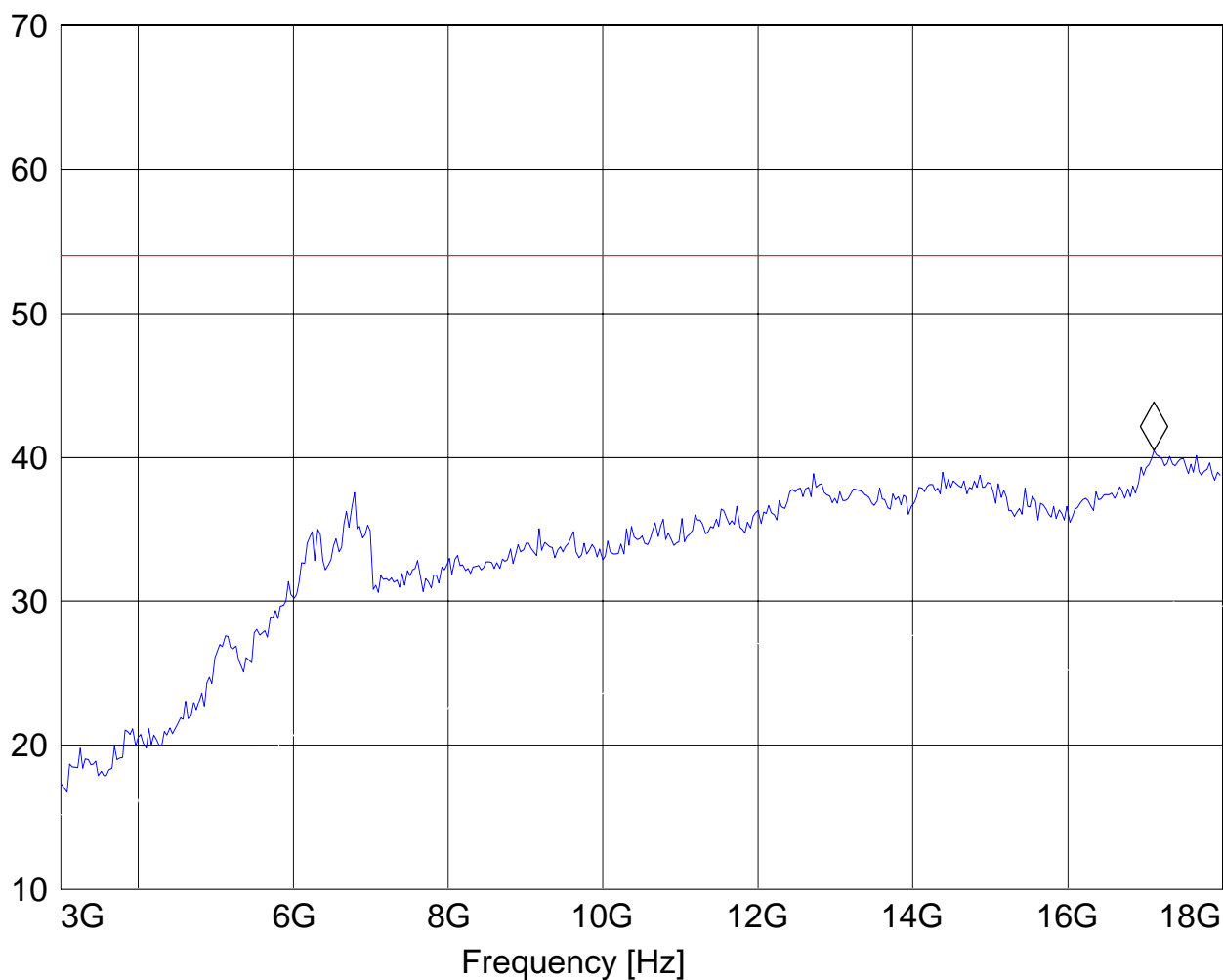
Ant Orientation: V

EUT Orientation: V

Test Engineer: Ed

Voltage:: Battery

Comments:: 360° rotation

**SWEEP TABLE: "FCC15.247\_3-18G"**Marker: 17.114228457 GHz 40.46 dB $\mu$ V/mLevel [dB $\mu$ V/m]

**18-25GHz****Note: This plot is valid for low, mid, high channels (worst-case plot)****Note: Peak Reading vs. Average limit****CETECOM Inc.****411 Dixon Landing Road, Milpitas CA 95035, USA**

Test Mode: WLAN-ODFM

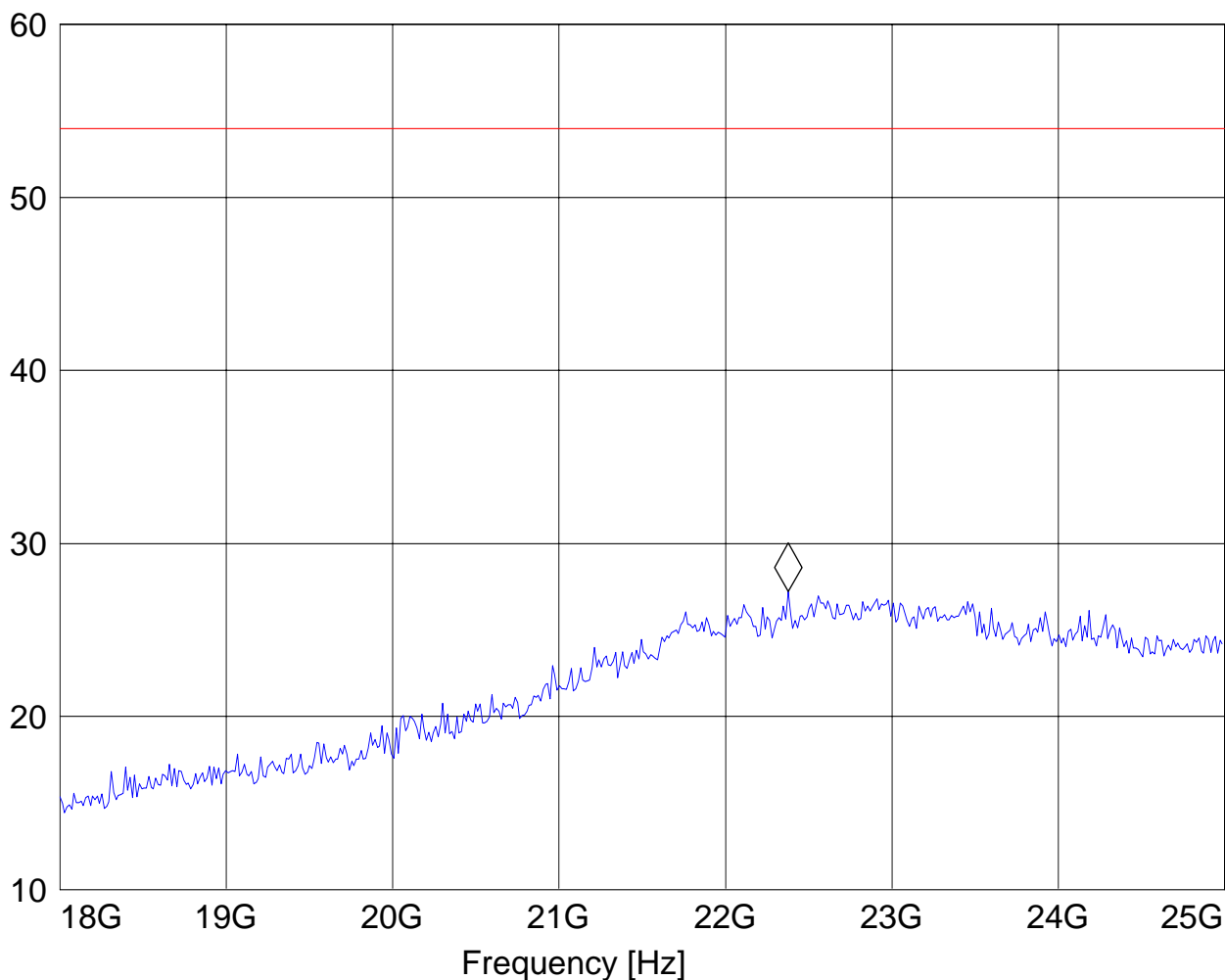
Ant Orientation: V

EUT Orientation: V

Test Engineer: Ed

Voltage:: Battery

Comments:: 360° rotation

**SWEEP TABLE: "FCC15.247\_18-26.5G"**Marker: 22.376753507 GHz 27.23 dB $\mu$ V/mLevel [dB $\mu$ V/m]



## **5.6 EMISSION LIMITATIONS**

**§ 15.247 (c) (1)**

### **Transmitter (Conducted)**

#### **5.6.1 Limits**

**In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions, which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).**

#### **Notes:**

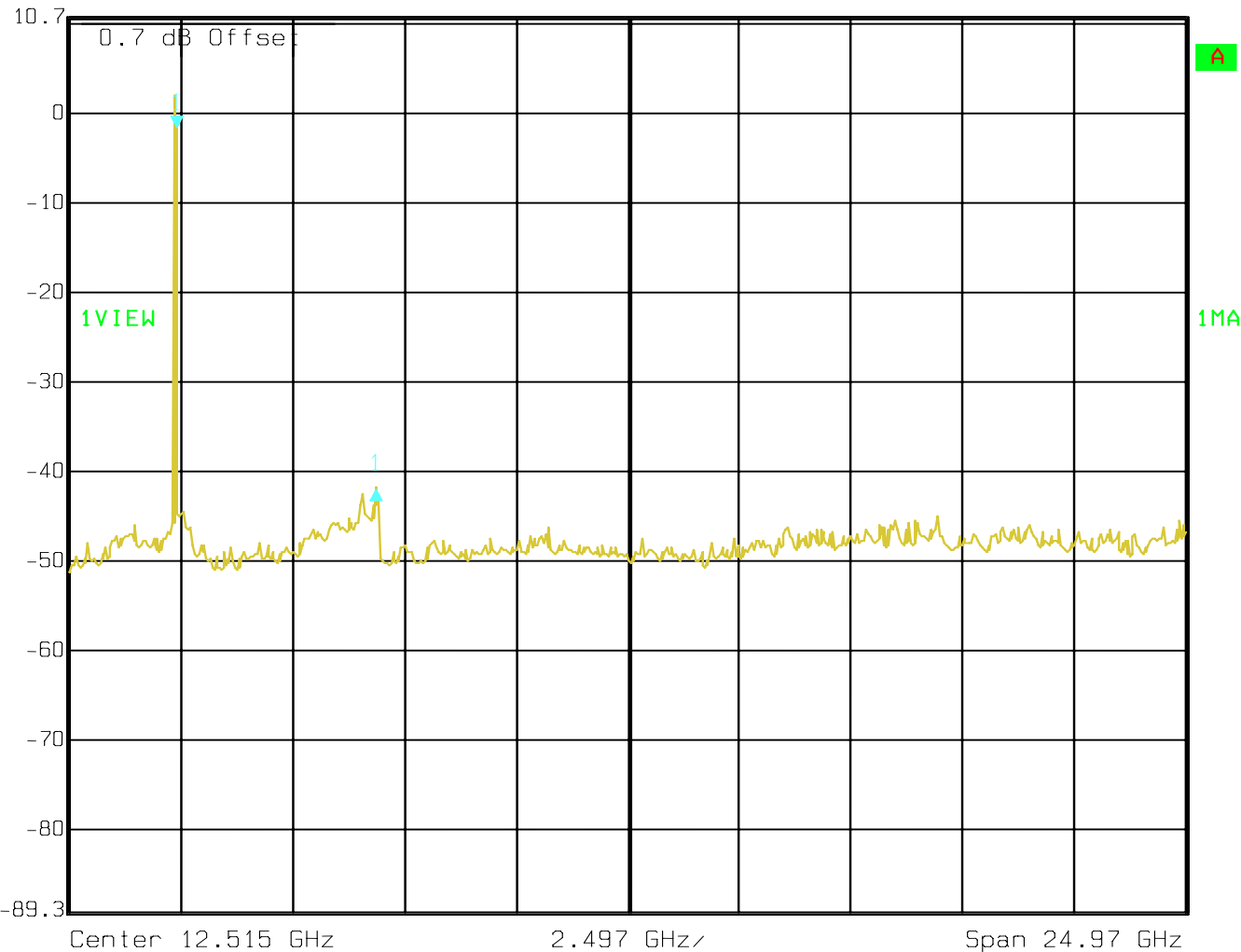
1. Measurements were performed with a spectrum analyzer.
2. During measurements the equipment was configured as shown in the block diagram of section 7 of this report.



5.6.2 Results  
(2412 MHz)



Delta 1 [T1] RBW 100 kHz RF Att 40 dB  
Ref Lvl -40.23 dB VBW 100 kHz  
10.7 dBm 4.47349098 GHz SWT 6.4 s Unit dBm

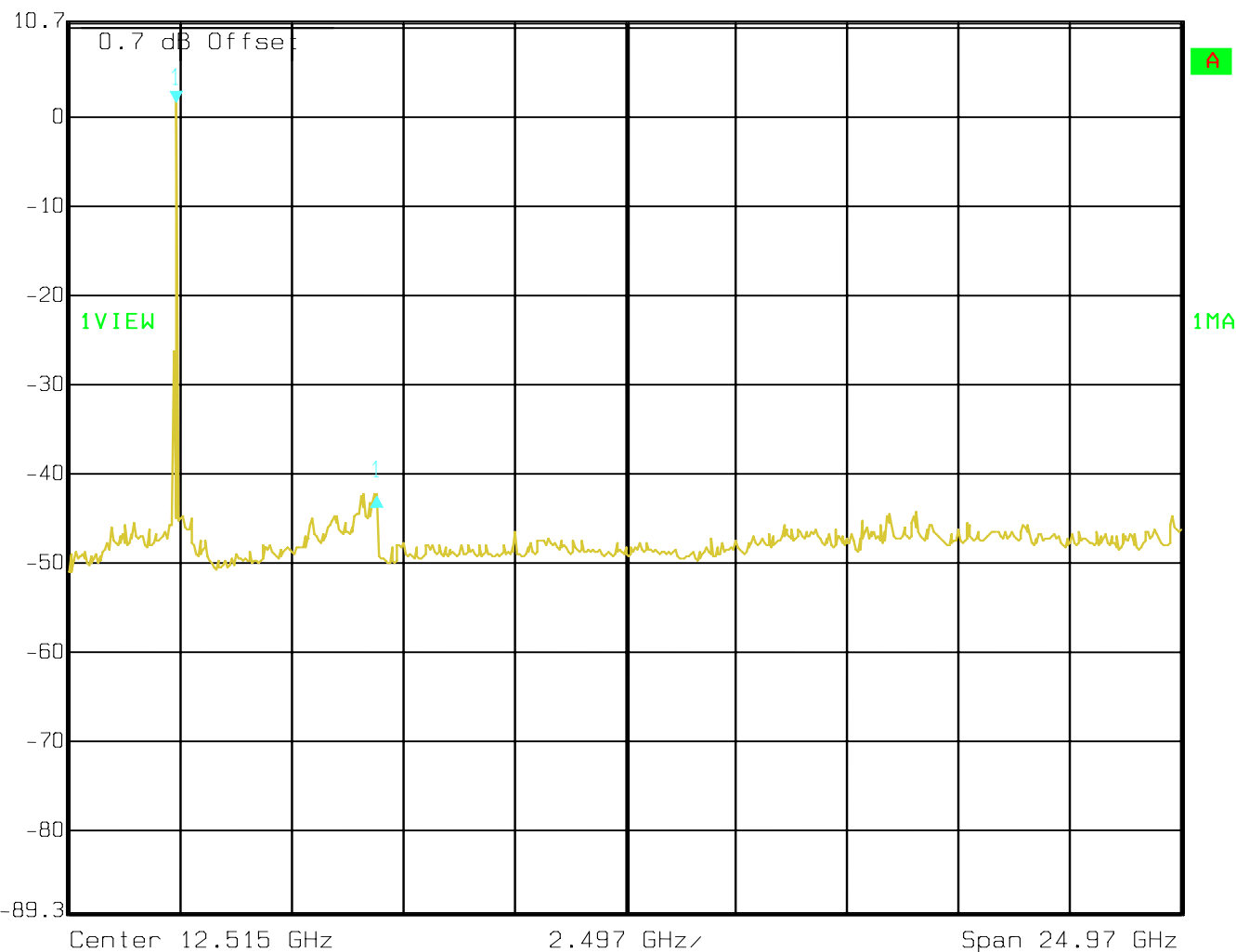




(2437 MHz)



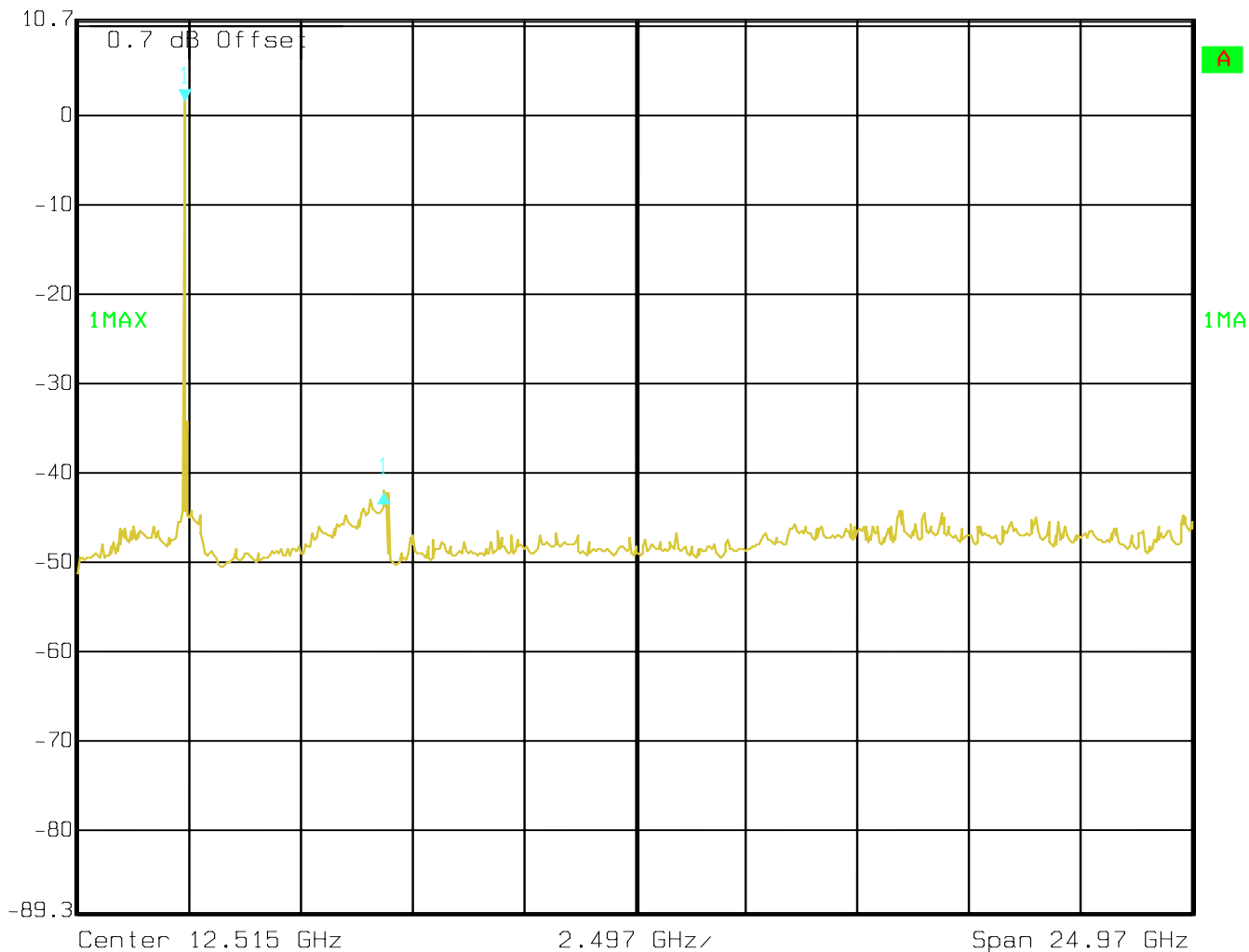
Delta 1 [T1] RBW 100 kHz RF Att 40 dB  
Ref Lvl -43.92 dB VBW 100 kHz  
10.7 dBm 4.49853106 GHz SWT 6.4 s Unit dBm



Date: 31.JAN.2007 18:36:37

(2462 MHz)


 Delta 1 [T1] RBW 100 kHz RF Att 40 dB  
 Ref Lvl -43.64 dB VBW 100 kHz  
 10.7 dBm 4.45356713 GHz SWT 6.4 s Unit dBm



Date: 31.JAN.2007 18:37:44



## 5.7 AC POWER LINE CONDUCTED EMISSIONS § 15.107/207

### 5.7.1 Limits

**Technical specification: 15.107 / 15.207 (Revised as of August 20, 2002)**

§15.107 (a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

#### Limit

Frequency of Emission (MHz)	Conducted Limit (dB $\mu$ V)	
	Quasi-Peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50
* Decreases with logarithm of the frequency		

**ANALYZER SETTINGS: RBW = 10KHz**

**VBW = 10KHz**

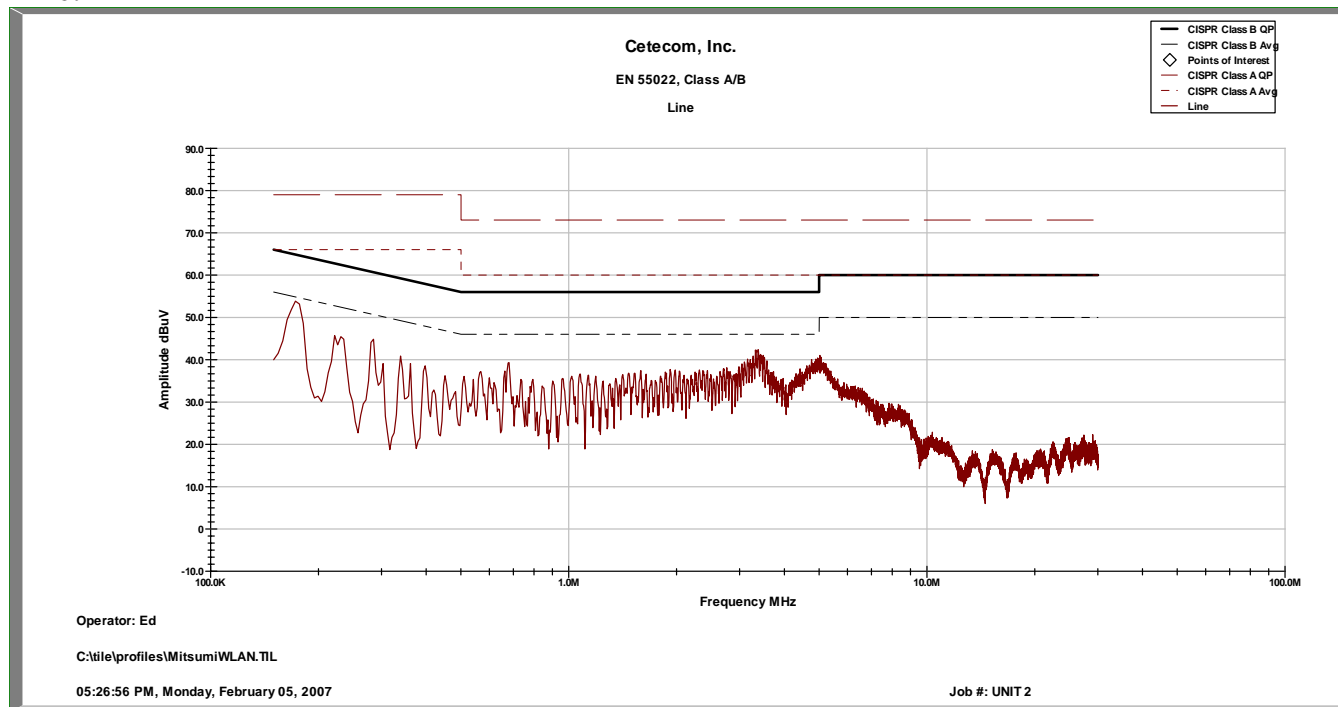
#### OPERATING MODE

Conducted AC emissions testing was performed with 110 VAC @ 60 Hz with the EUT in battery charging mode. During the testing an uncharged battery was installed in the EUT.

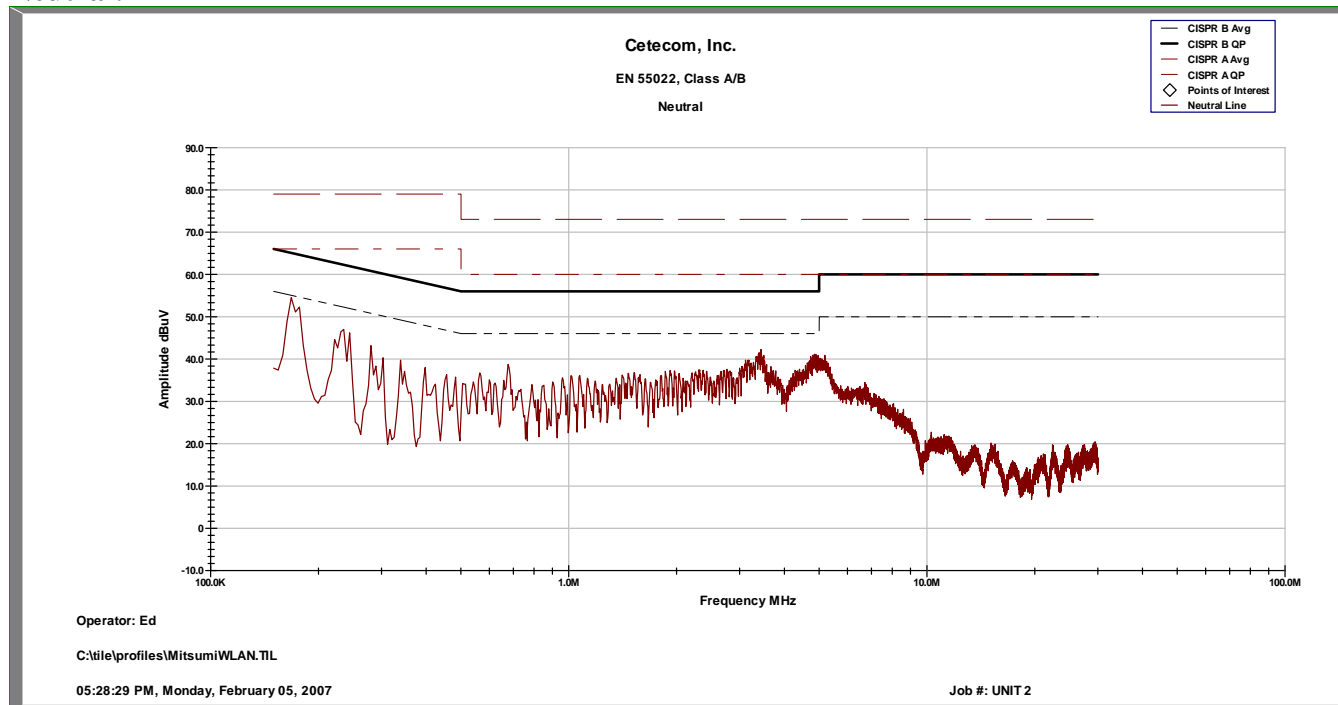


## 5.7.2 Results Mitsumi Charger

### Line:



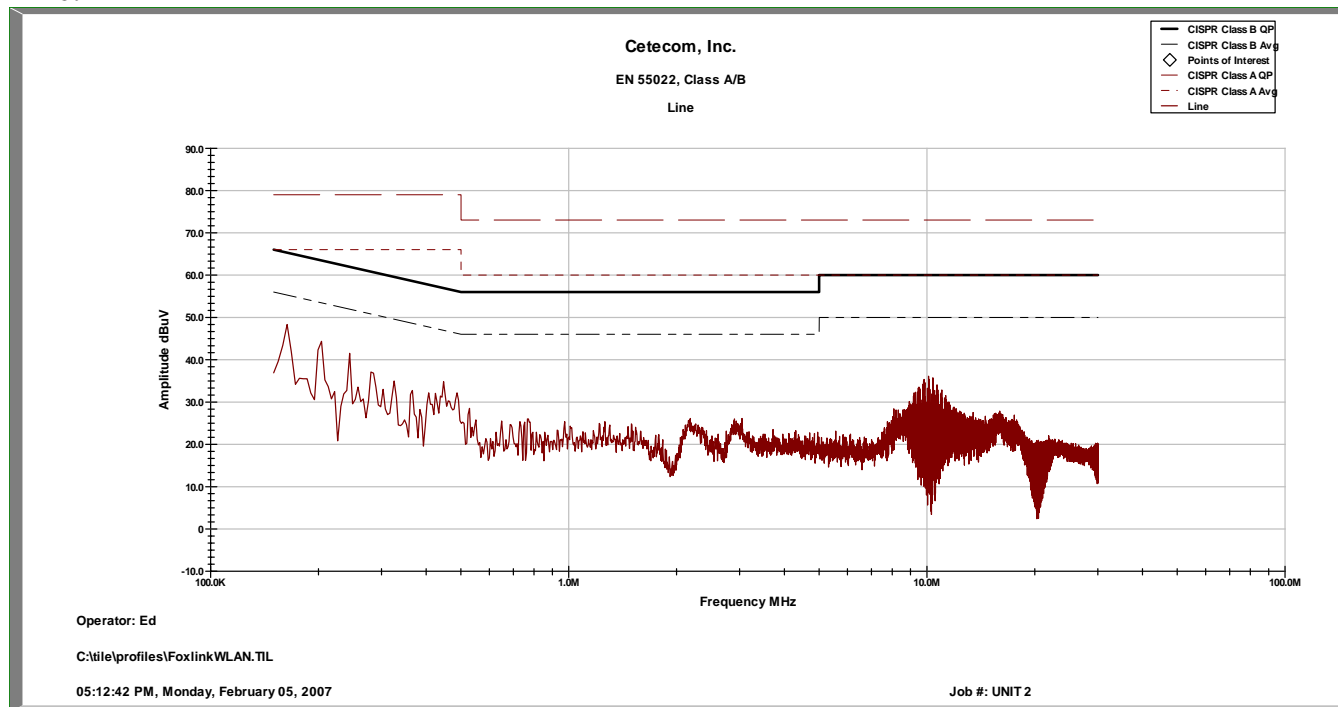
### Neutral:



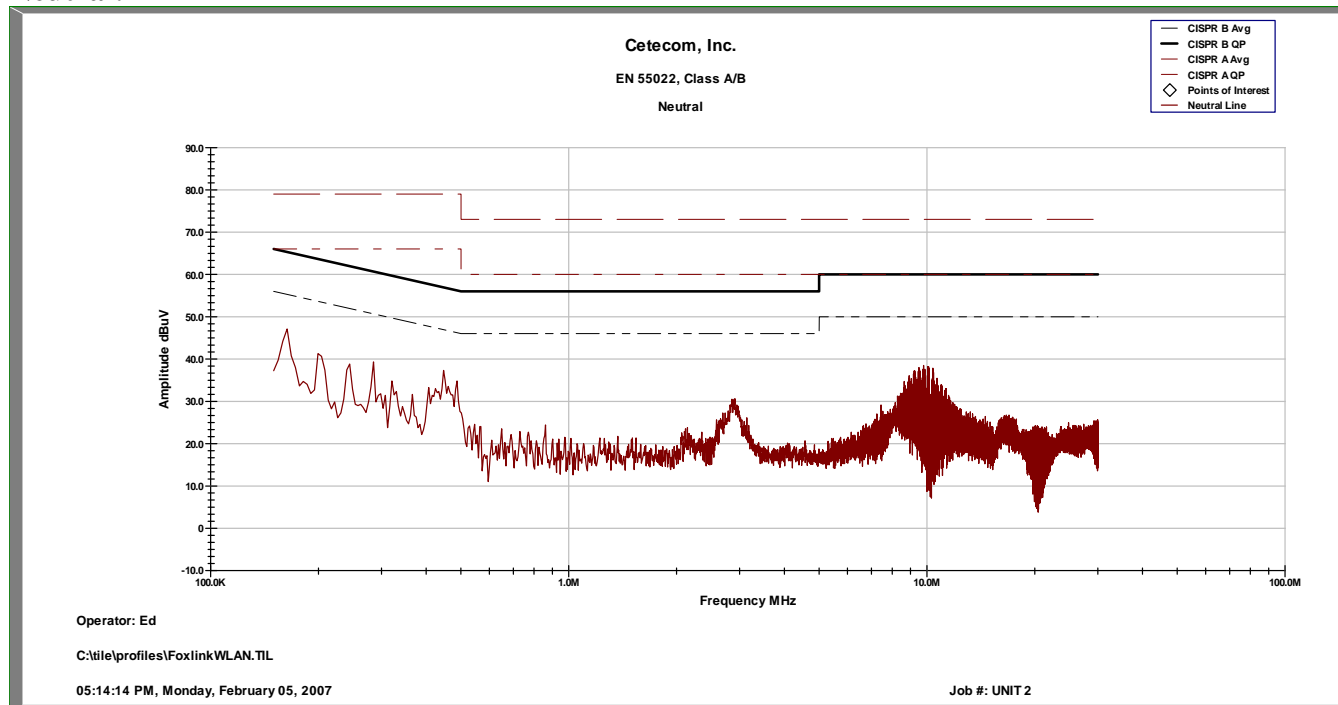


### 5.7.3 Results Foxlink Charger

#### Line:



#### Neutral:



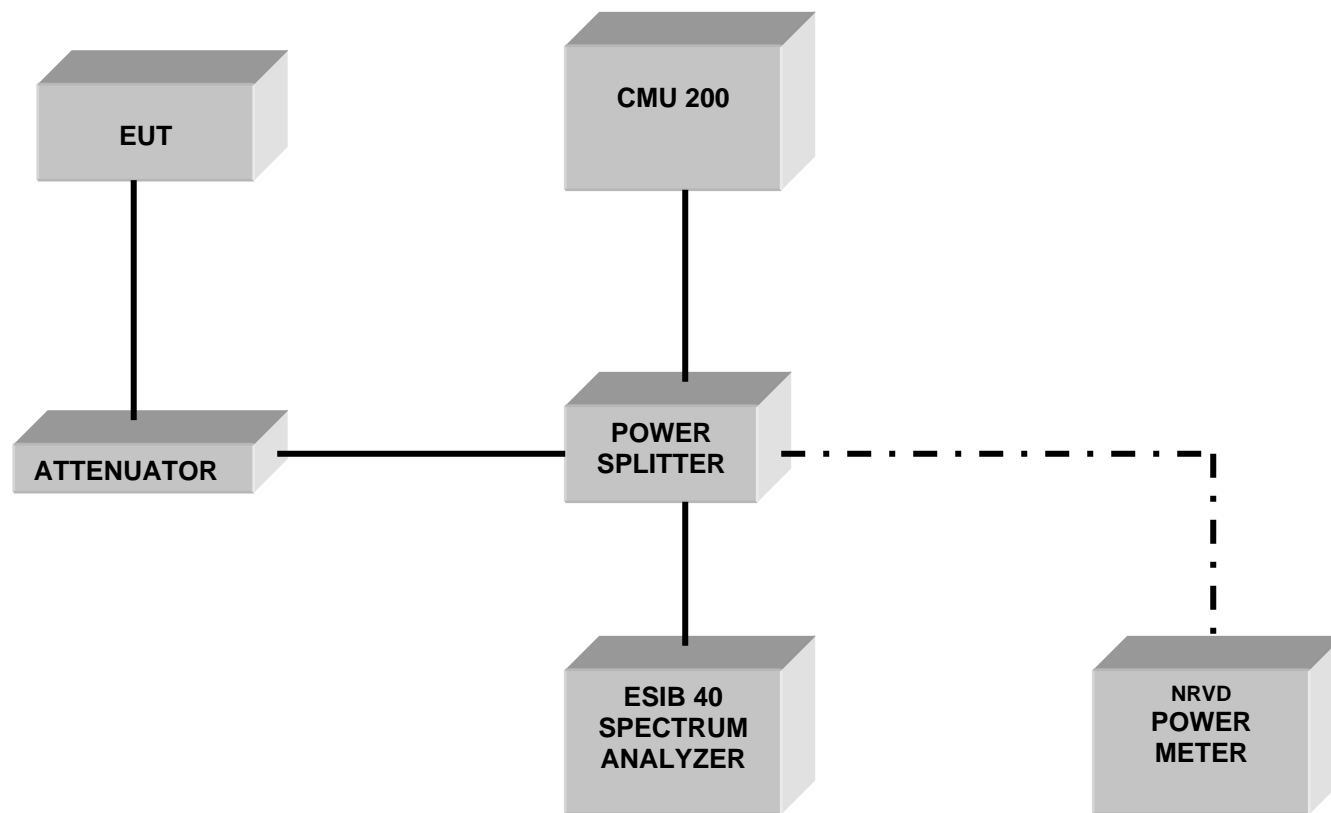


## 6 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

No	Instrument/Ancillary	Type	Manufacturer	Serial No.	Cal Due	Interval
01	Spectrum Analyzer	ESIB 40	Rohde & Schwarz	100107	May 2007	1 year
02	Spectrum Analyzer	FSEM 30	Rohde & Schwarz	100017	August 2007	1 year
03	Signal Generator	SMY02	Rohde & Schwarz	836878/011	May 2007	1 year
04	Power-Meter	NRVD	Rohde & Schwarz	0857.8008.02	May 2007	1 year
05	Biconilog Antenna	3141	EMCO	0005-1186	June 2007	1 year
06	Horn Antenna (1-18GHz)	SAS-200/571	AH Systems	325	June 2007	1 year
07	Horn Antenna (18-26.5GHz)	3160-09	EMCO	1240	June 2007	1 year
08	Power Splitter	11667B	Hewlett Packard	645348	n/a	n/a
09	Climatic Chamber	VT4004	Voltsch	G1115	May 2007	1 year
10	High Pass Filter	5HC2700	Trilithic Inc.	9926013	n/a	n/a
11	High Pass Filter	4HC1600	Trilithic Inc.	9922307	n/a	n/a
12	Pre-Amplifier	JS4-00102600	Miteq	00616	May 2007	1 year
13	Power Sensor	URV5-Z2	Rohde & Schwarz	DE30807	May 2007	1 year
14	Digital Radio Comm. Tester	CMD-55	Rohde & Schwarz	847958/008	May 2007	1 year
15	Universal Radio Comm. Tester	CMU 200	Rohde & Schwarz	832221/06	May 2007	1 year
16	LISN	ESH3-Z5	Rohde & Schwarz	836679/003	May 2007	1 year
17	Loop Antenna	6512	EMCO	00049838	July 2007	2 years

## 7 BLOCK DIAGRAMS

### Conducted Testing





**Radiated Testing**

**ANECHOIC CHAMBER**

